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FROM

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FIFTEEN VOLUMES.

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RIVER TYNE.

Session

12 *December* 1854 —— 14 *August* 1855.

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1854-55.

FIFTEEN VOLUMES:—CONTENTS OF THE

FOURTEENTH VOLUME.

N. B.—*THE* Figures *at the* beginning of the line, *correspond with the* N° *at the foot of each* Report; *and the* Figures *at the* end of the line, *refer to the* MS. Paging *of the Volumes arranged for The House of Commons.*

RIVER TYNE:

[1948.] REPORT of the COMMISSIONERS appointed to inquire into the present state of the RIVER TYNE; together with the MINUTES of EVIDENCE, and APPENDIX - - - - - - - p. 1

[1948-I.] AN ANALYTICAL INDEX of the MINUTES of EVIDENCE taken before the COMMISSIONERS appointed to inquire into the present state of the RIVER TYNE - - - - - - - 541

RIVER TYNE:

REPORT - - - - - - - - - - - - p. 5

MINUTES OF EVIDENCE - - - - - - - 11

APPENDIX - - - - - - - - - - - 441

INDEX - - - - - - - - - - - - 545

REPORT

OF

THE COMMISSIONERS

APPOINTED TO INQUIRE INTO

THE PRESENT STATE OF THE RIVER TYNE;

TOGETHER WITH

THE MINUTES OF EVIDENCE

AND

APPENDIX.

Presented to both Houses of Parliament by Command of Her Majesty,
May 1855.

LONDON:
PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1855.

1948

COMMISSION - - - - - - - iii

REPORT - - - - - - - v

MINUTES OF EVIDENCE - - - - - - - 1

APPENDIX - - - - - - - 429

COMMISSION.

VICTORIA R.

Victoria, by the Grace of God of the United Kingdom of Great Britain and Ireland Queen, Defender of the Faith: To Our trusty and well-beloved William Bowles, Esquire, Companion of the Most Honourable Order of the Bath and Vice-Admiral of the White Squadron of our Fleet, Sir John Bell, Knight Commander of the Most Honourable Order of the Bath and Lieutenant-General in Our Army, Robert FitzRoy, Esquire, Captain in Our Navy, Robert Baynes Armstrong, Esquire, One of Our Counsel learned in the Law, and Isambard Kingdom Brunel, Esquire; Greeting:

Whereas an humble Address has been presented unto Us by the Knights, Citizens, and Burgesses and Commissioners of Shires and Burghs in Parliament assembled, praying that We will be graciously pleased to appoint a Commission to inquire into the present State of the River Tyne, (One of the Highways for Navigation under Our Protection,) whether the Encroachments on the tidal Waters of that River by Jetties, Embankments, and other Works executed and proposed on the Banks thereof have not injured the Navigation, and will not continue to counteract the Plans for removing the Sand Banks at the Mouth of the River, and otherwise injure the Navigation of that important River:

Know ye, that We, reposing great Trust and Confidence in your Intelligence, Discretion, and Diligence, have authorized and appointed, and by these Presents do authorize and appoint you, the said William Bowles, Sir John Bell, Robert FitzRoy, Robert Baynes Armstrong, and Isambard Kingdom Brunel, to inquire into the present State of the River Tyne, (One of the Highways for Navigation under Our Protection,) whether the Encroachments on the tidal Waters of that River by Jetties, Embankments, and other Works executed and proposed on the Banks thereof have not injured the Navigation, and will not continue to counteract the Plans for removing the Sand Banks at the Mouth of the River, and otherwise injure the Navigation of that important River.

And for the better Discovery of the Truth in the Premises, We do by these Presents give and grant unto you, or any Three or more of you, full Power and Authority to call before you, or any Three or more of you, such Persons as you shall judge necessary, by whom you may be the better informed of the Truth in the Premises, and to inquire of the Premises by all other lawful Ways and Means whatsoever. **And** We do further by these Presents give and grant unto you, or any Three or more of you, full Power and Authority, where the same shall appear to be requisite, to administer an Oath or Oaths to any Person whatsoever

to be examined before you, or any Three or more of you, touching or concerning the Premises. And We do further by these Presents give and grant to you, or any Three or more of you, full Power and Authority to cause all Persons to bring and produce upon Oath before you, or any Three or more of you, all and singular Records, Books, Papers, and other Writings touching the Premises, and which shall be in the Custody of them or any of them. And Our further Will and Pleasure is, that you, or any Three or more of you, upon due Inquiry into the Premises, do certify to Us, from Time to Time, under your Hands and Seals, your several Proceedings, as the same shall be completed; and do within the Space of One Year after the Date of these Presents, or sooner if the same can reasonably be, certify to Us in like Manner the whole of your Proceedings under and by virtue of these Presents, together with what you shall find touching or concerning the Premises upon such Inquiry as aforesaid. And We further will and command, and by these Presents ordain, that this Our Commission shall continue in full force and virtue, and that you, Our said Commissioners, or any Three or more of you, shall and may from Time to Time proceed in the Execution thereof, and of every Matter and Thing therein contained, although the same be not continued from Time to Time by Adjournment. And We hereby command all and singular the Justices of the Peace, Sheriffs, Mayors, Bailiffs, Constables, Officers, Ministers, and all other Our loving Subjects whatsoever, as well within Liberties as without, that they be assistant to you and each of you in the Execution of these Presents. And for your Assistance in the due Execution of this Our Commission, We have made choice of Our trusty and well-beloved Frederick John Owen Evans, Master in Our Navy, to be Secretary to this Our Commission, and to attend you, whose Services and Assistance We require you to use from Time to Time as Occasion shall require.

In Witness whereof, We have caused these Our Letters to be made Patent. Witness Ourself at Westminster, the Fourteenth Day of November, in the Eighteenth Year of Our Reign.

By Warrant under the Queen's Sign Manual,

C. ROMILLY.

REPORT.

TO THE QUEEN'S MOST EXCELLENT MAJESTY.

We Your Majesty's Commissioners appointed under the Royal Sign Manual on the 14th November 1854, and commanded to inquire into the present state of the River Tyne, and whether the encroachments on the tidal waters of that river by jetties, embankments, and other works executed and proposed on the banks thereof have not injured the navigation, and will not continue to counteract the plans for removing the sand banks at the mouth of the river, and otherwise injure the navigation of that important river:

Humbly report, that on the receipt of Your Majesty's said Commission we wrote to W. S. Lindsay, Esquire, M.P. for Tynemouth, the mover of the Address to Your Majesty on this subject, requesting from him a statement of his views and opinions on the question, and the names of the witnesses he would recommend to be examined; and we at the same time wrote to the Tyne Improvement Commissioners, enclosing a copy of our Commission, and requesting answers to certain questions on the same subject, copies of which will be found in the Appendix (Nos. 4 and 6).

After some delay we received answers to these Letters (Nos. 5 and 7), and immediately gave notice to all the parties concerned of our intention to hold an inquiry at Newcastle on the 24th January 1855; and at the time and place so appointed we commenced our proceedings.

Five out of the eighteen members of the Board of Conservancy formed under the Act of 1850 appeared before us, assisted by counsel, and repeated certain charges brought forward in their letter of 3d June 1854 (Appendix, No. 1) and a subsequent memorial of 3d August 1854 (No. 3) addressed to the First Lord of the Admiralty.

The majority of the Board of Conservancy appeared also by counsel in answer to these charges, and under the circumstances we thought it desirable to hear these two parties, as in the character of plaintiff and defendant; and we continued our sittings at Newcastle until they had exhausted the evidence they respectively proposed to bring before us; much evidence was thus admitted which would not otherwise have appeared on the minutes. The result, however, has unquestionably been useful in eliciting information which we might have been unable to obtain by any other means.

After the conclusion of the case so conducted by interested parties, we obtained the evidence and opinions of several professional gentlemen who had not been called by either; and after fully considering all the evidence and matters adduced or urged before us we have arrived at a general conclusion on the questions referred to us. But before stating such conclusion, we think it right to preface it by a statement of the former condition of the Tyne as a navigable river so far as the earliest authentic sources of information enable us, and its comparative state at different periods, as shown by the various surveys made of it from 1813 down to the present time, and of the various opinions which have been advanced as to the principles on which such a river should be treated with the view to its improvement.

During the last two or three centuries all the evidence would lead to the conclusion that a very general similarity has been maintained in the state of the Tyne, notwithstanding local and partial changes.

In the present century much more exact surveys have shown a similar result; namely, that notwithstanding encroachments on both banks, and many artificial works executed with various objects, the navigable state of the river has not been much altered.

Whether it has been improved, and whether the works in progress are likely to improve it or otherwise, are matters of opinion, rather than fact, on which parties differ materially; but the preponderating evidence of good

authorities encourages a belief in some improvement. That this should still be only matter of opinion, needs explanation.

Formerly ships sailed up and down the river, and required greater width of channel than is now wanted for steam navigation.

At present the channel is less winding, and deeper, but it is not so wide as it was, and although the passage for steam-moved vessels appears to be improved, the navigable condition of the river for ships under sail, except with a fair wind, is probably to a certain extent deteriorated.

The earliest chart of the Tyne, with its soundings, is that of Collins, in 1682, from which there does not appear any reason to assume that the depth and width of the channels generally differed materially from what they are at present. Minute comparison is impossible, because of the absence of sufficient detail in his survey; but the depth of low water on the bar,—seven feet,—is well worth notice.

Nearly a century afterwards Fryer shows that there was about the same depth on the bar; and at the very latest examination, after the lapse of almost another century (1854), the depth remains about the same, varying only more or less from time to time according to the recent prevalence of freshes from the land or gales of wind from the sea.

During the last forty years three distinct, elaborate, and totally independent surveys of the Tyne have been made by thoroughly competent persons.

Between 1813 and 1815, Messrs. Giles and Comrie surveyed the river in great detail for Mr. Rennie, the late eminent engineer; and in 1848–9, Messrs. Comrie executed a most elaborate survey of the whole river for Mr. Rendel, which was accompanied by numerous investigations, among which the tidal and other calculations are very valuable.

The Admiralty Survey, in 1849–50, by Mr. Calver, is so valued a work that the Admiralty sent his chart of the Tyne to the British Exhibition in 1851. The agreement between this and the others is remarkable, and conclusive as evidence, as each survey was made entirely independently of the others.

The general correspondence between the calculations of 1815, 1849, and 1854, though certain differences occur, is striking, and tends at once to prove, not only the correctness of the surveyors, but the surprisingly small amount of change (all things being considered that might have tended to affect the river) that has actually taken place in the general depth and navigable capacity of the Tyne.

In 1854 Messrs. Calver and Comrie made additional investigations, still independently of each other.

While adverting to these various contributors to a knowledge of the Tyne, it would be impossible to pass unnoticed the extensive and elaborate inquiries instituted by the Admiralty in 1848–49–50–51–52. From the ample records of those inquiries we have derived great assistance and much information; and from all the sources thus supplied we have been enabled to prepare an analysis which gives positive and unquestionable results, uninfluenced by opinions or prejudice, as to the state of the river in the several successive periods of 1813, 1849, and 1854. A tabular statement in the Appendix gives the details of this analysis. The general result confirms the opinion expressed that very little change has upon the whole taken place during the period of upwards of 40 years in the actual navigable capabilities of the river.

Much controversy has been maintained with respect to the governing power in operation in the Tyne,—as to whether the fresh or the tidal water has the greater effect. From the evidence as to the extent of the land-floods which occur and the effects which are felt for some time after each such occurrence, it is impossible to doubt that the maintenance of the channel above the entrance may be greatly influenced by such causes; but it would appear probable that it is the daily ebb and flow of the waters from the sea that principally maintains undiminished the width and depth of that part which may be termed the estuary, and which regularly scours the channel within its reach; it is, therefore, of the greatest consequence to admit and properly direct the largest possible quantity of tidal water.

Although this is admitted by all whose opinion is of value, yet the best mode of attaining the object has been and still is the subject of much controversy.

By some it is considered important that the momentum of the water or the current which is caused on this coast by the tidal wave should be directed into the mouth of the river, and thus made to assist the effect of the tidal wave in carrying the body of water up the contracted channel of the river; and unquestionably such an addition to the effect of the mere elevation of the water at the entrance must, to a certain extent, be beneficial. By others, engineers of high authority, as will be seen by the evidence, it is maintained that such addition is unimportant, and that the mere statical pressure of the rising head of water will produce practically the whole effect desired, and that the position of the piers which will form the entrance must be governed by other and more important considerations. It appears to us that upon the whole the weight of evidence is in favour of the latter principle in this particular case, and would lead to the conclusion that shelter and protection to the vessels entering the harbour, and the dispersion and consequent dissipation of the waves or seas which may roll in, are objects more important to secure and more easily attained than the maintenance of the momentum and the direction of the current; and this view has been adopted as the general principle in the plans of piers now proposed, and from which we anticipate great benefit to the harbour and river of the Tyne.

The question of the best mode of rendering the ebb and flow of the tidal waters and the stream of the land waters most efficient in deepening and maintaining the depth of the channel of the river above the entrance is one upon which still greater differences of opinion are entertained and have been expressed, by many competing authorities.

By some it is maintained that, while, as all agree, the principal force of the flow of water in the river should be directed and limited by artificial means to a regular channel of proper form and dimensions, the quantity of water admitted at each flood tide, and which consequently must return on the ebb, should be maintained as large as possible by allowing the water to flow over the walls or banks formed to direct the main current; these are the advocates of half-tide training walls.

By others it is maintained that a considerable retardation of the tidal wave is created by such means, and that the velocity of the wave being diminished by these causes it will travel a less distance as well as with less velocity up the channel, and the effective scour be thereby materially diminished, while the advantages, unquestionably great in many instances, of reclaiming and forming a considerable extent of valuable land for commercial purposes, will be sacrificed, and the existing line of shore be rendered even less valuable than previously by the construction of half-tide walls at various distances in front and by the gradual silting up of the intervening spaces.

We are disposed to conclude from the evidence laid before us that not only should every river, as observed by Mr. Rendel, be treated according to its own peculiar character, but that strictly speaking each part of the same river may require different management, and the variance of opinion expressed by eminent engineers when treating the question as a general one may thus be nearly reconciled; that in many reaches of a river the water may be allowed to expand without materially retarding the tidal waves, and the quantity of water thus admitted and discharged may be increased with benefit to parts of the channel or of the entrance below, while at other points sensible injury would be caused by such a plan; and on the contrary very great advantages might result from confining and directing the whole volume of water between nearly parallel full-tide walls.

Without, however, entering more generally into this disputed question than is necessary on the present occasion, but limiting our views strictly to the actual case, looking at the result of the evidence as to the effects which have been observed on the river Tyne, and of the opinions expressed by professional men in the course of our inquiries, and of those opinions which have been brought under our consideration by documentary evidence,—considering also all the circumstances of the present state of this river, and the extent of private commercial establishments and public docks formed or likely to be formed on its shores, and weighing the advantages and disadvantages of adopting one uniform system,—our opinion is in favour of the construction of full-tide walls carried continuously along well-defined river lines

somewhat similar to those laid down by Mr. Rennie in 1813 between Newcastle Bridge and Shields, which have not been materially departed from in the various plans proposed subsequently by different engineers, and which have been approximately adhered to by the engineer of the Conservancy Commissioners.

Such being the opinion we have arrived at, we may add, that upon the whole the works which have been constructed appear to us to be consistent with the adoption in future of the plan of full-tide walls; but as the mode and the rate of proceeding with any such works may have a material influence upon the question whether such works are injurious or beneficial, and whether they are, during their progress, and possibly for a considerable time, inconvenient encroachments or useful improvements, we feel called upon to express an opinion upon these progressive stages, and the time occupied by them. The construction of the cross jetties or groynes described in the evidence appears to have had no other object than as affording the means (as it is alleged) of more economically constructing the training walls; but, until the subsequent formation of these, for a considerable distance above or below the groynes, the latter (in some cases carried improperly much beyond the river line) appear to have produced, as might be expected, violent local scouring and disturbance and distortion of the channel, and to have produced bad as well as good effects; which might have been avoided, and much time saved, by the immediate formation of the river wall. The rate of progress of these works might, however, depend upon the amount of funds available for the purpose.

The income of the Conservancy Commissioners is mainly derived from what are termed ballast dues, or compulsory payments levied on vessels entering the port for the removal of their ballast. The gross amount of such payments is necessarily subject to reduction by the cost to the Conservancy of disposing of this ballast, and the sums that they pay on this account to parties having licensed depôts to receive it, appear to us to be very large.

But there was no evidence adduced before us to show that the Commissioners are obliged so to dispose of the ballast, or that they are precluded from applying it to the filling up behind the training walls, or from carrying it to sea, or even from still more beneficially disposing of it by making terms with parties who are desirous of making land behind the river lines laid down by the Commissioners, at points where such filling would be advantageous to the river; and as the full-tide walls make progress, it may reasonably be expected that this last mode will become a general one. By any of such alternatives (some or all of which ought, in our opinion, to be resorted to as speedily as possible by the Commissioners) the funds available for what are strictly permanent river works, as distinguished from dredging and other temporary expedients, may be greatly increased, the rate of progress of these works proportionably accelerated, and the ultimate total cost of dredging and other annual expenses incurred for expedients, which it may be hoped will become unnecessary when the works of improvement are completed, be thereby greatly reduced. Much might also be done to prevent evil effects from the dilapidation of quays and river walls, and the accidental falling, or intentional casting in of materials into the bed of the river, and also from the washing down of materials from above bridge.

The effect of new works may also materially depend upon the removal of existing natural projections, such as Bill Point, and others that have been referred to in the evidence, and which, although not "encroachments," in the ordinary sense of the term, may be considered such when viewed in connexion with the new works, and the general plan of river line undertaken. With these views, we cannot express our concluding opinion upon the points referred to us without at the same time advising, that the completion of the training walls as full-tide walls, according to the river lines already settled, should be hastened; that no groynes or jetties (if constructed at all) should be allowed to project beyond such lines; that effectual means should be adopted for preventing the navigable channel from being injured by the washing down or casting in of materials from the banks, or from any other source, whether above or below Newcastle Bridge; that efficient means should be taken, by the establishment of tide gauges at several points, and by continuous observations and soundings, to record the changes of the river, and

particularly that the information thus obtained should be accessible to the public; and lastly, that the funds of the Conservancy should be husbanded, and devoted to the permanent improvements of the river.

Subject to these qualifications with reference to the past and to these conditions as affecting the future proceedings, we are of opinion that the encroachments on the tidal waters of the Tyne by jetties, embankments, and other works executed and proposed on the banks thereof, have not injured the navigation, and will not counteract the plans for removing the sand banks at the mouth of the river, or otherwise injure the navigation of that important river.

In concluding our Report we are desirous of expressing our sincere hope that the differences and disputes which have hitherto prevailed in the Tyne Improvement Commission, and so much interfered with its usefulness, may from henceforth cease to exist; that all its members may be induced to believe that the interests and prosperity of Newcastle and Shields are identical and inseparable, and to bury in oblivion those local jealousies and animosities which can only prejudice the community to which they belong.

All which we humbly submit to Your Majesty.

Witness our hands and seals, this 19th day of May 1855.

WM BOWLES. (L.S.)

JOHN BELL. (L.S.)

ROBERT FITZROY. (L.S.)

ROBERT BAYNES ARMSTRONG. (L.S.)

I. K. BRUNEL. (L.S.)

Frederick John Evans,
Secretary.

MINUTES OF EVIDENCE.

LIST OF WITNESSES.

Page

Thursday, 25th January 1855.

Joseph Straker, Esq. - - - 38
Mr. John Walker Lamb - - 57
Commander William Purdo, R.N. - 59, 71
Mr. William Pearson - - 61
Mr. Matthew Poppelwell - - 71

Friday, 26th January 1855.

Joseph Straker, Esq. - - 79
Captain William Linskill - - 81
William Alexander Brooks, Esq. - 90
James Cochran Stevenson, Esq. - 91
Mr. Simon Danson - - - - 112
Edward Killwick Calver, Esq., R.N. 115

Saturday, 27th January 1855.

Edward Killwick Calver, Esq., R.N. 120, 141
Mr. Alexander Comrie - - 134
William Alexander Brooks, Esq. 136, 141

Monday, 29th January 1855.

William Alexander Brooks, Esq. - 156
Thomas John Taylor, Esq. - 182
Mr. John Francis Ure - - 189
Mr. William Wake - - - 192
Joseph Freeman - - - 196
Jacob Harrison - - - 196

Page

Tuesday, 30th January 1855.

Mr. John Francis Ure - - 198
Leonard Brown - - - 201
William Story - - - 202
Mr. Charles Dunn - - - 204
John Clayton, Esq. - - - 206
Joseph Cowen, Esq. - - - 228
Christian Allhusen, Esq. - - 241
James Mather, Esq. - - 244
John Robinson, Esq. - - - 248
Ralph Park Philipson, Esq. - - 250
Mr. William Wake - - - 253

Wednesday, 7th February 1855.

James Meadows Rendel, Esq. - 284

Thursday, 8th February 1855.

James Meadows Rendel, Esq. - 290

Friday, 9th February 1855.

Robert Stephenson, Esq., M.P. - 306

Monday, 12th February 1855.

James Meadows Rendel, Esq. - 320
George Macartney, Esq., M.P. - 333

Friday, 16th February 1855.

James Walker, Esq. - - 336
John Murray, Esq. - - 349

Wednesday, 7th March 1855.

William Alexander Brooks, Esq. - 360

MINUTES OF EVIDENCE

TAKEN BEFORE

THE COMMISSIONERS

APPOINTED TO INQUIRE INTO

THE PRESENT STATE OF THE RIVER TYNE.

The Commission sat at Newcastle-on-Tyne from 24th to 31st January 1855, and afterwards at the Office in London.

Newcastle-on-Tyne, Wednesday, 24th January 1855.

PRESENT:

VICE-ADMIRAL WILLIAM BOWLES, C.B., IN THE CHAIR.
LIEUT.-GENERAL SIR JOHN BELL, K.C.B.
CAPTAIN ROBERT FITZROY, R.N.
ROBERT BAYNES ARMSTRONG, ESQ., Q.C.
ISAMBARD KINGDOM BRUNEL, ESQ., C.E.

Mr. Webster.

24th January 1855.

(*Chairman.*) The Secretary (Mr. Frederick J. Evans, R.N.) will read the Commission under which we assemble here to-day.

The same was read by the Secretary.

(*Chairman.*) I apprehend the gentlemen at whose wish the Honourable Member for Tynemouth moved the Address for this Commission are prepared to open the case, and state what evidence they have to bring in corroboration of any statement which they may wish to make touching the same.

(*Mr. Webster.*) Yes, Sir.

Sir,—It is my honour to appear before you on behalf of the minority of the Tyne Conservancy Commissioners, at whose instance, so to speak, this Commission has issued. And, Sir, it would be impossible to overrate the importance of the questions which you will have to consider. This is not the opposition or the proceeding of a minority who have recently become active; they have been the constant opponents of the course of policy and of the works which have been executed almost from the first day of the meeting of the Commissioners. They have been and are still perfectly satisfied, that the course which has been pursued by the Tyne Conservancy Commissioners under the Act of 1850 is substantially the same course as was pursued before 1850, and which led to the numerous inquiries which have taken place on this subject. The opposition, appearing as it does in the form of a minority against a majority, of course may give rise to remarks, as it has done; but the questions are really of the largest and most important description.

You are aware, or at all events you will be aware by the documents to which I shall call your attention, of the relative position and the relative interests of the two Shields and of Newcastle. It has been for many years, and still is, a complaint, that so far as regards the interests of Shields proper they are almost entirely neglected, and that so far as regards the interests of Newcastle, the money derived mainly from shipping at Shields has been applied almost exclusively for the benefit of Newcastle and of persons connected with Newcastle, and they assert that the same line of policy is still carried on. But even that, Sir, does not represent to you the real and extensive nature of the question; it is a question of the shipping and commercial interests of this country generally against the local interests and against the landowning interests, for whose advantage, and under whose influence, the course of policy and of proceeding which we say must be ultimately detrimental to this navigation was dictated, and is still dictated. The question did assume and still assumes the same form, which is this:—You have at Shields and in the Port of Shields, which is an independent port for certain purposes (for Customs' purposes quite independent), an enormous shipping interest, raising a very large revenue, that has been and is still practically under the control of Newcastle interests, and expended more or less for their benefit.

Now, Sir, I said that this was not a new question—there are a great number of documents. I hold in my hand a document written as early as 1836 by one of the highest

Mr. Webster.

24th January 1855.

authorities with reference to this question, as it affects the present conservancy and the interests of Shields as against those of Newcastle, namely, a pamphlet written by Mr. Armstrong, who was Chairman of the River Committee, introducing the statement of an eminent gentleman, Captain Phipps, who says the Tyne was "capable of being rendered "one of the finest rivers in the world, but which ignorance, inattention, and avarice have "converted into a cursed horsepond." That is the language of a gentleman of the greatest experience—the Chairman of the River Committee, and who is, I believe, in the room at the present moment, and probably will be called as a witness before you. Now, Sir, no doubt that is a strong expression; but there are other paragraphs in the pamphlet to support it, and I cite it to impress you, as I have no doubt you are impressed, with the importance of this case, and with the real question which we shall submit to you, that the state of things then existing, and admitted to exist upon the testimony of Mr. Armstrong, the Chairman of the River Committee, and at present a Tyne Commissioner, has not been substantially varied, but that the shipowning interests are subject to very nearly the same inconveniences and the same want of accommodation as they were then.

Sir, I shall refer as much as possible to the documentary evidence, and as a part of it, to what appears in Captain Washington's Report. It will be very convenient to take the years 1849 and 1850 as dividing lines, so to speak, because you are aware that this contest, of which your present inquiry is not exactly a prolongation but a species of review, assumed a definite form in the autumn of 1848, and was the subject of a Parliamentary investigation during 1849. The Bill which was then brought in, having been passed by the House of Commons, was lost for want of time in the House of Lords, the session coming to an early conclusion; and in the session of 1850 it was resumed by the Shields interests, but the corporation of Newcastle, then the legal Conservators, seeing that their day was come, and that they must make the best terms they could, themselves introduced a Bill in 1850, which is now the Tyne Conservancy Act, in order to remedy the very same defects and the very same inconveniences on account of which the Shields people had promoted their Bill in 1849. Therefore, Sir, upon that state of things, it is an admitted fact, which the corporation of Newcastle could not then deny, and which the Commissioners, so far as they represent corporation interests and Newcastle interests, cannot deny, that the allegations contained in the evidence before the Inspector and in the Report of Captain Washington were substantially true; and I shall, therefore, rely upon those documents and upon other documents which were put in evidence then, and which have since been the result of Parliamentary inquiries, and of inquiries before the Inspectors of the Admiralty, in support of the case which I have now to submit to you.

Now this question which is submitted to you by the Royal Commission, and which was under consideration in 1849, and was entrusted to the new Conservancy, is the maintenance of the Tyne in a proper and efficient state, with such alterations as may be adapted to the altered circumstances of the river. Those circumstances have materially changed since the early times. Inland ports have now become of second-rate importance. There was a time when it was desirable, partly for protection, and partly owing to the size of ships, to get as far inland as possible, and the position of ports and of docks was placed at the head of navigations. The case now is entirely altered, and what Parliament has now to legislate for, and what has now to be provided for by the Admiralty on behalf of the public, is accommodation for ships as near the sea as possible, for a larger class of ships, and a different class of ships; as, for instance, take the case of coppered vessels that will not admit of taking the ground. In fact, the state of things is so altered that if this question is to be dealt with upon the same narrow policy as in former times, and which is still sought to be pursued, you are really presenting a state of circumstances wholly unadapted to the altered state of the times.

Sir, I told you that this was a matter which had attracted the attention of Mr. Armstrong, the Chairman of the River Committee, as early as 1836. You will remember, Sir, that about the year 1845, there was a Harbour Commission, which sent out a very elaborate Report, and in the year 1846 this contest assumed a definite shape by a Committee or Deputation of the Shipowners' Society of South Shields, who founded themselves very much upon a principle laid down by the Tidal Harbour Commissioners, which is contained in their first Report at page 9, that—"As a general, although not a universal principle, "no cause has operated more extensively to injure the entrances of harbours throughout "the United Kingdom than excluding the tidal waters from lands below the level of high "water, which served as natural reservoirs for the flood tide, and were the means of "affording a valuable scouring power during the ebb." Then, Sir, that portion of the Report goes on to say, having reference to Southwold,—"We have thought it right to "enter into the above details, since Southwold is entirely dependent upon tidal waters for "existence as a port, and since the value of the daily tidal scour in all our harbours does "not seem to be sufficiently appreciated, nor can any case more strongly prove the duty "of jealously guarding against similar encroachments." Now, Sir, I call your attention to that, because it is a paper of the highest authority, and because in the proceedings of the Shipowners' Society of South Shields, that was, so to speak, made one of the cardinal points of the conditions upon which they then insisted. The deputation from that Society, which consisted of the principal Shipowners of South and North Shields, met the Members of the river Committee of which Mr. Armstrong was Chairman, and presented their case in one of the forms which the minority now present it to you. In those

Mr. Webster.

24th January 1855.

proceedings the question of the exclusion of tidal water was made a leading feature, and I shall have occasion (I merely call attention to it now in giving the history) to advert to one or two passages in the Report hereafter. Under the influence of those principles so cemented by the Shipowners' Association in union with the Shields interest, the proceedings and state of things, which came to a head in 1849, had their origin.

Sir, I told you that the Tyne was assumed in the proceedings of 1849–50, by the proceedings of Newcastle itself, certainly to have stood still, if not to have retrograded. That was the assumption which was made as the foundation of the legislation, and which was the result of the most voluminous evidence, which was gone into, firstly, before Captain Washington, secondly, in the session of 1849, after many weeks' inquiry, and by subsequent Admiralty and other inquiries.

Therefore, Sir, I take it for granted that you will assume that to a certain extent to have been an admitted fact; and in the observations which I shall have to address to you I may adopt, for instance, the sentiments which are expressed by Captain Washington at page 7 of his very elaborate Report, upon which the Bill was originally introduced, who reviews the general result, and who states the circumstances in this manner:—"The "complaint of the Shields' Shipowners, the promoters of this Bill, is not so much that "the bar is bad, but that while Sunderland and Yarmouth, both bar harbours, on the "same east coast of England, have within these few years gained from four to six feet in "depth, Tyne bar has remained stationary; and that while the Tay, the Clyde, the Liffey, "the Lagan, the Orwell, the Wyre, the Tees, and even the Nene, all similar river "harbours, have within the last 30 years gained an increased depth, varying from four to "ten feet, up to the cities and towns respectively of Perth, Glasgow, Dublin, Belfast, "Ipswich, Preston, Stockton, and Wisbeach, the Tyne up to Newcastle, with its "enormous traffic and comparatively princely revenue, has remained stationary, if it has "not deteriorated, both in width of channel, and in depth."

Now, Sir, in the inquiry of 1849, both before Captain Washington and before the Committee of Parliament, we had all sorts of evidence, a sort, I was going to say, of homœopathic examination into inches of water and inches of sand. Why, Sir, that was all very well, and it was possibly necessary, that that should be gone through, where you had the princely fortunes of the Corporation of Newcastle on the one hand, and the equally princely subscriptions of the gentlemen of Shields on the other, to carry on the contest. But if you are to go into that inquiry now, you will be sitting here certainly till pretty nearly the end of the session of Parliament. I apprehend that you will do no such thing; that you will look to what has been already proved, and if there be any facts disputed, upon which you yourselves are not satisfied, and which you think necessary to have ascertained, you will have them ascertained upon your own authority, after I have discharged my duty in bringing before you, as succinctly an I can, the case of the minority, and the complaint which they have to make.

Captain Washington having in his Report referred to the traffic and the revenue, which (I am not quite sure whether I have mentioned it already) consisted of no less than 42,000 arrivals and sailings at that time, viz., in 1849, and a revenue of 27,000*l.* a year, derived from the river, calls attention to places like Sunderland and Hartlepool, which are all quite independent of the question of improvement in the bar, Hartlepool not being the case of a bar harbour. The Shields' gentlemen and others were perfectly aware that the great secret of the success of those places, that their enormous increase, while the Tyne had stood still, was due not only to the improvement in the approaches, but perhaps mainly to the question of the establishment of docks. That changed the condition of things entirely, because every one whom I have the honour to address must be well aware that no coppered ships and no ships adapted to the present state of the times, and to carrying on that which has become one of the most important trades, the steam coal trade, would go, if they could help it, into a place without docks, and therefore that of itself was a feature sufficient to have prevented the progress of the Tyne, even without other circumstances which ought to have taken place. And, Sir, I remember distinctly (I believe it appears in Captain Washington's Report) that it was proved that considerably less freight would be taken from other places than the Tyne, because of the state of things as regards the approaches and the want of accommodation.

Now these funds, which were stated at 26,000*l.* or 27,000*l.* a year at that time, as stated by Captain Washington at page 3 of his Report, were disposed of in this manner. He says—"That on an average for the past seven years the income derived from the river (exclusive "of payments for conveying ballast) has exceeded 26,000*l.* a year, while the sum laid out in "improvements has been less than 5,000*l.* a year." Now, Sir, you will find that this has a remarkable connexion with the present state of things, for the money laid out up to the present moment in actual river improvements, as contra-distinguished from making land in which either the corporation or the private parties have an interest, is ridiculously small, so small that I will not trust myself at the present moment to tell you what I have upon my note, for fear I should be mistaken; that I shall supply hereafter. He goes on to say—"From an inspection of the corporation's accounts of the last year it seems that the "receipts from the river were 27,907*l.*, and the expenditure, including salaries, &c., 10,824*l.*, "showing a balance otherwise appropriated of rather more than 17,000*l.* In the column "of payments it will be seen that the cost of watching the borough for the past year was "6,229*l.*, whereas the rate levied for watching was only 3,774*l.*," and so on; "thus "showing a deficiency of rates of 17,447*l.*, corresponding very nearly with the amount of

Mr. Webster.

24th January 1855.

" river dues not expended on the river." Then he goes on to say—" According to the " abstract of accounts printed in the Appendix, the whole amount received from the river " since 1809 has been 957,973*l.*, while the whole sum laid out on the river, including all " charges for conveying ballast, salaries, management, &c., during that period has been " 397,719*l.*, the difference between these two sums, exceeding half a million of money, having " been appropriated to the lighting, paving, watering, and scavengering the streets of New- " castle." That, Sir, is a state of things, so far as regards the result, which has, to a certain extent, ceased; but it has not ceased altogether. No longer is this enormous revenue applied to the streets of Newcastle, but you will find hereafter how it has been applied, and what has been the effect of those works which have been made as encroachments on the river and the state of this navigable highway which is the special matter of your inquiry.

Sir, I have referred to the proceedings of 1849, and the Bill which was promoted by the Shields' party. That was essentially a Conservancy Bill, and it proposed that all the money earned upon the river should be spent upon the river; and, further, that if land was made out of river funds it should not become the property of the Corporation of Newcastle, but that there should be some proper adjustment of the value of it, and also some proper dealing with the improved or deteriorated value of the foreshore; adopting this principle, that what was earned upon the river should be applied to the benefit of the river, that what was paid by the public should be received by the public, and should be diverted to no other purpose whatever, that being strictly consistent with the recommendation of the Tidal Harbour Commissioners. The facts upon which that Bill was founded, as I have said, will not I apprehend be now disputed. They were the foundation of the Bill of 1850, which the corporation themselves promoted, and, therefore, in the present case, must be taken as admitted to be true. Most of the new facts are contained in Reports of Surveying Officers since Captain Washington's Report; two or three Admiralty Inquiries; a Report by Captain Vetch, which incidentally touches upon this question; an Inquiry before Mr. Lawes and Mr. Abernethy; an Inquiry before Mr. Walker; an Inquiry before Mr. Hawkshaw; and several Admiralty Reports upon matters not contained in Captain Washington's Report. Also, subsidiary Reports by Mr. Calver to the Admiralty upon specific matters, which will be brought before you here as grievances and encroachments and nuisances, so to speak, established since the Act of 1850. There are also the Reports of Engineers, Mr. Rendel, for instance, who was employed by the old conservators, and who was paid by the new conservators, and whose Report I think will be found to be one of the most important documents which has been given upon this subject.

Now one of the great grievances and great complaints made before the Inquiry, and which led to the Bill of 1849, was the want of any plans. It was said—" Though you, the conservators, had in 1816 Mr. Rennie's Report, which is a most elaborate report, and a chart of the Tyne, all you did with it was to keep it in your corporation chest. You have gone on tinkering the river, so to speak, without any plan, just as it suited the particular emergency, or interests, or wishes, or objects of the moment." And that I may not misrepresent anything, I would refer you as authority for that to Captain Washington's Report; at page 5, he there refers to all the existing plans. He says—" The earliest plan of the Tyne with which I am acquainted " is by Grenville Collins, hydrographer to King Charles the Second." And then he speaks of the dimensions of it, and he says, " I repeat, however, that no great reliance can be placed " upon the exact position of Collins' depths." I do not read the whole paragraph; I do not mean to occupy more of your time than I can help, having a good deal to go through; " but his plan is highly instructive as holding out a distinct warning when compared with " Giles's survey," that was Rennie's survey, " that the Tyne is subject to remarkable " changes in its bed, and therefore requires the greater care in dealing with it as a whole, " and that it must not be trifled with in detached portions." Now, Sir, that opinion of Captain Washington, founded upon the information of these old charts, on which he does not place any very great reliance, although one of them had marked within Tyne bar " a depth of 7 feet at low water, and 21 feet at high water spring tides, being much the " same depth as at present"—and other dimensions—that paragraph, speaking of the peculiarity of the Tyne, the character of its bed, the great changes to which it was subject, and the danger of dealing with it in detached portions and not as a whole, introduces a matter which you will find has been the opinion of all the leading engineers and of all the persons who have attended to this subject as a whole, and it is one of the great causes of the complaint which the minority have to make, that the conservators have never carried out this principle, but that although they had Mr. Rennie's plan, although they had Mr. Rendel's plan, neither in 1849 nor in 1850, nor since that time, are there traces at all of anything like a consistent dealing with the river as a whole in the manner in which it should be dealt with. The same principle, and the same trifling, so to speak, or dealing with detached portions, has been pursued up to the present moment, and still is pursued, except as they have begun to set their house in order within a very short time, finding that the Commission was coming; the same treatment, in direct contravention of Captain Washington's suggestion and the reports of the most able engineers, has been pursued. That, Sir, namely, the want of a plan, the want of a system, and of treating the thing as a whole, and with regard to proper surveys of this river, is one of the great causes of the complaint which has been invariably urged, both against the old conservancy and against the present conservancy. One leading matter which was very much insisted upon before Captain Washington, and which will be insisted upon very much by the witnesses, is this: Mr. Rennie had laid down what he called lines for river walls, up to which works might

Mr. Webster.

24th January 1855.

come, and beyond which they should not go; those have not been adhered to. I do not mean to say there are not places where a witness being asked, Is not that upon Rennie's line? will say, Yes; but there are other works not upon Rennie's line, there are other works behind it, there are other works before it, and there are other works, so to speak, upon no line at all. That was illustrated before the Committee of 1849, by the large plan which is now down stairs, which can be put up upon this wall, if necessary.

(*Mr. Armstrong.*) Is that Mr. Rennie's plan?

(*Mr. Webster.*) This, Sir, is a reduced copy from Mr. Rennie's plan, having upon it Mr. Rennie's lines, Mr. Brooks's lines, and the encroachments which have been made. This is a document with a few dabs upon it of yellow colour to show recent encroachments, but there is down stairs the original plan, introduced on the wall of the Committee Rooms of the Houses of Parliament in 1849 and 1850, of which this is a reduced copy.

In that paragraph of Captain Washington's Report, where he refers to other plans in which he speaks of the depth of water at different places, he says this, "We now come to "the year 1813," that was the date of Mr. Rennie's or Mr. Giles's survey; Mr. Giles was his assistant in the matter, and he was also assisted by a gentleman, I am sorry to say now no more, Mr. Comrie, who was employed by Mr. Rendel to complete the observations; he says, "We now come to the year 1813, at which period Rennie was consulted as to im- "proving the river. His first step, as the only sure basis on which to found a report or "to project works, was to set on foot a detailed survey of the river from Tyne Bar to "Newcastle Bridge, with a complete series of tide observations. This work was carried "out by that accomplished surveyor Francis Giles, who the following year produced an "elaborate plan of the river. This plan revealed for the first time the true state of affairs; "it made manifest a narrow channel, contracted at places to 60 yards in width; 70 acres "of dry sand bank in the bed of the stream; a ridge of stones projecting half across the "entrance; a bar with only 6 feet water over it at low water of spring tides, and several "projecting points, causing difficulty and danger to navigation. In August, 1816, Rennie, "after due consideration, laid down on this plan certain river lines, up to which he recom- "mended in his report all quays and other works should be advanced, and beyond which "none should project; he also generally advised straightening, confining, and deepening "the channel, and especially the removing St. Anthony's and Bill Point, as the greatest "obstructions to navigation in the river. Too much credit cannot be given to the New- "castle Corporation of the years 1812–13 for their wisdom and liberality in procuring this "admirable plan, and for consulting the most eminent engineer of his day as to the works "for improvement of the river. It was a first step in the right direction, and the plan "(as long as it exists and is legible) will be the standard to which all future works of "improvement on the Tyne must be referred." Now, Sir, I certainly concur in that opinion of Captain Washington, that too much credit cannot be given to the then Corporation for getting such a plan, and for availing themselves of the first assistance; but, Sir, having got it, they did nothing with it, excepting preserving it in their chest; and one great cause of complaint was that the works which had then been conducted, and it is now the complaint that the works which have since been conducted, have been conducted without reference either to that plan or to any systematic plan as a whole, thereby leading to the consequences which are insisted upon in this Report.

Now, that I may not be supposed to misrepresent the state of this case, I would rather adopt Captain Washington's language than my own. He says, at page 7, with reference to this point, under the head of "New works, river lines, removal of obstructions, state of "the river banks:"—"It will be readily supposed that after obtaining Giles's elaborate "plan, and Rennie's Report, at a cost of some 2,000*l.*, the Corporation had resolved to set "to work in earnest, to carry out the recommendations of the most eminent engineer of his "day. I regret to say that such was not the case. Rennie, after discussing the tides in "his Report of 1816, laid down the great principle of river improvement, and advised the "enlarging or contracting the channel, so as to cause the flood and ebb stream to run in "the same channel; the maintenance of the same or increased amount of tidal water, by "the removal of 73 acres of dry sand bank to a depth considerably under low water; and "by the construction, generally, of half-tide walls, with the exception of the whole "length of Shields and most of Newcastle, where should be regular wharf walls of "masonry. He also specially recommended the cutting off Whitehill Point, Bill Point, "St. Anthony's Felling Shore, and Friar's Goose Point; and laid down river lines on his "plan, up to which all works were to be advanced, and beyond which none were to "project." Then he says, "To improve the bar, Rennie recommended a south pier;" into which I do not at present go, because that has been a matter of subsequent consideration, upon which I shall have to say a word hereafter, but it has no bearing upon the present part of the argument.

Then Captain Washington reviews the Report of Mr. Richardson in 1834. I shall not follow him through that, because there it is—you may like to refer to it. I may have one or two remarks to make upon it hereafter. He does not appear to have had that valuable pamphlet of Mr. Armstrong, to which I have alluded. He also notices the Report of the River Improvement Committee, of which Mr. Armstrong was chairman; also the Report of the River Jury; also the Reports of Sir William Cubitt, of Mr. Brooks, Mr. Murray, and Mr. Macgregor: he reviews all those, and he says in conclusion, "With reference to "a general plan of improvement, no works worthy of the name have been undertaken. "Rennie's river lines, deliberately and carefully drawn, appear to have been abandoned

Mr. Webster.

24th January 1855.

" without sufficient consideration, and a line adopted, as far as it can be made out, which " at times agrees with Rennie's, at times falls far within it, and at other times as far " without it." Now, Sir, that was the state of things as regards the question of river lines, an all important question in the treatment of a river of this peculiar character and constitution.

Then, Sir, he goes on; he makes observations on the soundings, and about the state of the channel at different points. I do not mean to go into that, because really a little more water here and a little more water there is due entirely to local circumstances and accidents, and has nothing to do with the great question which you are now to adjudicate upon. He says, at page 10, " To return for a moment to the river lines. If the resident engineer's " line is to be adhered to,"—that was Mr. Brooks's, and you will find, Sir, upon this plan that Mr. Brooks's lines are laid down in blue, and Mr. Rennie's in red, so that this plan will show you exactly the position,—" To return for a moment to the river lines. If the " resident engineer's line is to be adhered to, the extensive new quay at Walker's ironworks, " built on Rennie's line, some part of it as late as 1844,"—observe that, Sir, as late as 1844, although Mr. Rennie's plan had been in their possession so many years, this Walker's quay being corporation property,—" must be carried farther into the river. At a " little more than 5½ miles from the bridge, the proposed breadth of waterway is 860 feet, " but the actual width now left between the jetties on the north side and the staith and " groyne on the south side, appears to be about 740 feet; the line must then be given up, or " the works be removed. Potter's stone quay at Willington, and other quays, do not range " with the proposed line. At the jetty at the west end of Hebburn quay, the intended " breadth of waterway is 700 feet, whereas the actual breadth is only 640 feet—some 60 " feet, then, must come off the jetty not long since finished. These are trifling details " into which I would much rather not enter, but they seemed requisite to show that the " conservators of the Tyne, who have been bold enough to abandon Rennie's river lines, " cannot have the most distant idea of what lines they are now carrying out; nor is it " possible they should, as no one plan having on it Rennie's lines, the proposed lines, the " the depth of water, and the new works was ever laid before them; at least none such, " although repeatedly asked for, could be produced on the inquiry." Now, Sir, we say that that was a state of things which the Legislature might well have determined to cure at all hazards, I was going to say, so to speak, in violation of all principles which had ever been acted upon before, although I do not concede that the Corporation had ever any right of personal or private interests to these dues, so as to give them the right to expend them upon the streets of Newcastle. There were conflicting opinions upon the right of the Corporation to these dues, which the Municipal Corporation Act pretty well put an end to. Yet this was a state of things which the Legislature might well have been disposed and justified, in violation of all principles, to put an end to, and that was done by the House of Commons in 1849, and by the Legislature in 1850, upon the admission of the Corporation themselves, they themselves having brought in a Bill for this very purpose, which is now the Conservancy Act; and our complaint is, that the same state of things and want of management, and mismanagement as to river lines and works exist even up to the present time.

Now, Sir, Captain Washington had referred in the preceding part of his Report to Mr. Rennie's recommendations about cutting off various portions of the river. I did not read that paragraph, because I did not think it necessary, but he says this,—" As to the " removal of the obstructions so generally condemned by all parties at Whitehall Point, " Friar's Goose, and opposite St. Anthony's, nothing has been done, although Rennie, to " enforce his recommendation as to the latter, wrote upon his plan, 'Many ships have been " 'wrecked here.' The resident engineer, too, says, 'It is a deep hole and rocky shore; " 'the tide sets heavily into the bight, therefore it is dangerous;' and Henry Oates, " a pilot, adds, 'It is as likely a place as any to wreck a vessel on.'" Now, Sir, you will hear hereafter whether anything and what has been done to obviate those grievances as regards those specific points which were remarked upon by Mr. Rennie, and which were remarked upon by the then engineer to the conservators, Mr. Brooks, and which were commented upon by Captain Washington. Then he goes on,—" At Bill Point, where " the river makes an abrupt turn, a portion of the cliff has been removed, and the channel " above the point successfully straightened by a series of bold groynes placed by the " resident engineer; but the rocky point, denounced by Rennie, Richardson, and the " River Jury, still exists." I shall have occasion, Sir, hereafter to call your attention more in detail to that particular point upon the river, and therefore I will say no more upon it now.

Sir, another great cause of grievance which was adverted to, and which still exists in full force, and almost in aggravated force, and leads more to the deterioration of this great highway than any other, is the question of ballast. It is the fourth head of Captain Washington's Report, and that you may have a notion of the importance and magnitude of it, I will read this paragraph. "4thly. The deposit of ballast, owing to the nature and " extent of the traffic on the Tyne, and its chief trade being an export trade, it is evident " that large quantities of ballast must be brought to the port. The coals exported from " the Tyne in 1847 were 3,466,527 tons, employing 20,713 vessels. Of these vessels " probably 15,000 arrived in ballast, bringing on an average 60 tons each, or 900,000 tons " of ballast annually to the Tyne. Till within about the last 25 years, the greater part of " this ballast was landed, but great competition in the coal trade having arisen in conse-

Mr. Webster.

24th January 1855.

" quence of the activity of neighbouring ports, shipowners, it is stated, could no longer " afford to pay the dues attendant on landing it (which vary from 1*s.* 4*d.* to 1*s.* 10*d.* a ton), " and it is now generally cast at sea by English vessels. Of these 900,000 tons, only " 170,000 tons paid dues on landing, thus leaving more than 700,000 tons cast at sea, or " unaccounted for." Those facts, Sir, disclose a very curious state of things. This ballast question, which upon this part of the subject was a shipowner's question, was so oppressive, that English vessels actually ran the risk of casting their ballast at sea, and coming into harbour without ballast. Now, the very small quantity of this ballast that did come into harbour gave rise to the enormous ballast hills upon which South Shields at present stands, which you may have seen, and which have aided, in many years gone by, to fill up, so to speak, the estuary of the Tyne. But the question of the ballast, in connexion with the river encroachments, and with the ownership of the soil and the foreshore rights, is at the root, so to speak, of some of the grievances in the Tyne. It led to the construction of these works in the irregular manner in which you must have seen them constructed; at all events, in which they are shown to be constructed upon this plan. This plan, as I told you, contains Rennie's lines and Brooks's lines; but it also contains at different places, in colours, these, what we call, encroachments upon the foreshore, made by the landowners, but principally by the Corporation of Newcastle, whereby land was made out of the river by means of this ballast. Now, so long as the Corporation were the owners of the ballast dues, this was the state of things: they received 1*s.* 4*d.* a ton from the ship, and then either employed that ballast to make land, or they paid persons to dispose of it, paying about 10*d.* a ton. The price given is not very material. One great cause of complaint was this which still exists, that for a large quantity of this ballast, the conservators (for I will pass away from the Corporation), who take the ballast dues, receive 1*s.* 4*d.* a ton, and they pay 10*d.* in certain cases. One of the causes of grievance is this: the conservators pay particular landowners 10*d.* a ton for depositing that ballast somewhere; it is very often placed between high and low water mark on the foreshore, but it is washed into the river again, and the conservancy have to take it out; so that under the state of things existing at this moment, the conservators pay persons for depositing the ballast; a considerable portion (at all events there is an inducement) is washed into the river, which they have to take out again by dredging; so that they are paying for a place of deposit for this material, they themselves having very often to take it out again in the shape of dredging, or they are paying for making the land of the landowner by means of this ballast. That, you will find, Sir, is a matter which is perhaps one of the leading points at the root of the deterioration and the grievances of which we complain.

Now this plan of 1849, in addition to showing the river lines of Mr. Rennie and Mr. Brooks, and the land which has been made at different periods, shows the jetties, which is another important question. It also shows the staiths for coals. There are in the Tyne many places for shipping coals; for instance, Hayhole, a place which, probably, you saw; and there are many other places at which these jetties are run down. These are shown upon this plan. That was the system which was pursued in the Tyne in opposition to the recommendation of Mr. Rennie, and, I believe, every engineer excepting Mr. Brooks, who seems to have a great partiality for this mode of operation. The partiality happens to have suited the interests of his employers most particularly. He has a great partiality for this system of full-tide jetties, transverse jetties; that is to say, jetties placed across the foreshore, which, being either up to high tide, or above high tide in many instances, obstructed the flow of the water, produced a scour in the channel immediately opposite them, and therefore removed a sand there, but deposited it somewhere else, so that really it was only making bad worse, because it produced a state of uncertainty from the operation of them; but so far as regards the interests of the landowners, it is the very best mode of making land, at all events, a very sure mode, and the cheapest mode. This system of full-tide jetties placed athwart the foreshore was contrary to the recommendation of Mr. Rennie, who recommended half-tide training walls, and contrary to the recommendation of Mr. Rendel, and, I believe, of every engineer excepting Mr. Brooks. He has his own particular view upon it. He has carried it out in the Tees with considerable success, but the case of the Tees is as different from the case of the Tyne as two things can possibly be. That system of depositing ballast between high and low water mark, and the cognate system, so to speak, of these jetties, which, under pretence of improving the channel, did contribute most materially to making land, have been uniformly condemned by the minority, whom I now represent, from almost the first meeting of the Commission; and those, therefore, are matters upon which I shall have to take your opinion, and which I shall have to submit to you more in detail.

I have now, therefore, Sir, brought you down in general statement to the condition of things in 1849 and 1850, and my general allegation is that, although the Corporation, the then conservators, admitted, by bringing in this Bill of 1849, now the Conservancy Act, that this was the state of things, yet that substantially the same state of things has continued since, and that we are really asking your adjudication and direction upon the same diseases, evidenced by the same state of facts, now as then. Mr. Rennie's Report and lines, as you are informed by Captain Washington, have not been acted upon, and almost worse than not acted upon, because, under colour of acting upon them, they have been departed from in every possible way, leading to the evils of which we complain. The two Shields' parties (by whom I mean the parties both of North and South Shields, because there is no division of opinion between them upon this question; they are

Mr. Webster.

24th January 1855.

agreed upon this question, whatever may be the minute difference of opinion which personal interests, of course, will always give rise to upon some questions,) having become consolidated, so to speak, upon that Shipowners' Inquiry of 1846, determined in 1848 to bring in a Conservancy Bill. The Shields gentlemen had some experience of the tactics of the Corporation, under the able guidance of one of the most able men, and they, therefore, were very well advised not to let it be known what was going forward. The Corporation were, therefore, caught asleep, and these Shields gentlemen got ahead of them; but matters could not be kept secret longer than November, and the Corporation employed Mr. Rendel, as great an authority as Mr. Rennie had previously been. He was perfectly independent, and had then had nothing to do with the Tyne. The notices for the Bill, of course, would be given in the November of 1848 for the session of 1849. Mr. Rendel was employed towards the close of 1848, or the beginning of 1849, the precise date is not material. He was the professional adviser of the Corporation, and engaged in the survey, and he made himself sufficiently acquainted with the facts to be examined as a witness against the Bill of 1849 in Parliament, so that his attention was called to it very soon after the Bill was deposited. He carried on his survey and continued the professional adviser of the Corporation and the new conservators after the Act of 1850 was obtained, and he was paid for it by the new conservators out of the conservancy funds. His Report which has been printed, was accompanied by a very elaborate Appendix, which, I believe, has not been printed, but which, of course, the Clerk of the Commissioners will, no doubt, lay before you; at all events, I shall be entitled to ask for it if he does not. That Report was made public, or, at all events, was dated on the 11th of October 1851. The Bill of the Corporation of 1850 contained no power for works; it was simply a money bill and a transference of powers. The Shields gentlemen in 1849 had said, "We do not want your money, if you will let us have our river put in a proper state." They consented in that respect, even as they have done with regard to moorings. You will be surprised to find that the moorings in the Shield's harbour were actually provided for by an additional tax upon the shipping, notwithstanding the enormous revenue of the Corporation from the river. They said, "We do not want your money, we want the Con-"servancy." The Newcastle Conservancy Bill of 1850 created, so to speak, a Parliamentary title, instead of the very questionable title, to the coal dues and other dues which the Corporation had been taking; and that was a wise and very good policy, because there is no question that great doubts existed as to the title to these dues. The Corporation, therefore, being disposed to set their house in order and to keep what they could, secured the debt which had already been contracted to a certain extent, and they made a compromise as regards the dues to be taken and applied to the conservancy purposes, and the share that they were to keep of the spoil. That was, therefore, a compromise, so far as the money and dues questions were concerned, which the shipowners were glad to take. The fact is, they were getting well nigh exhausted. They had gone through an enormously expensive Parliamentary contest in 1849; they had re-introduced their Bill in 1850; they were, therefore, very glad to accept the best terms they could from the Corporation, knowing that when the charm was once broken, unless the thing was done properly, some further inquiry or commission like this, or a proceeding of the Admiralty or some public board, would enable them to get things set to rights. But, Sir, upon one point they never compromised, and they never consented at all. They were obliged to fight it out before a Committee of the House of Commons, and that Committee, I think, made a great and a fatal mistake, which is the great and fatal mistake which has brought us before you, Sir. The Committee of the House of Commons constituted a Commission, which was resisted to the last by the Shields persons, because they knew it would only be a perpetuation of the very grievances and the very same state of things which existed before. However, they were willing to take that as a first instalment; they had no other alternative. There can be no security against these encroachments, and the perpetuation of the abuses, excepting you can have the matter placed in the hands of distinct and independent parties; and, although that is not a matter which is precisely stated upon the face of the Commission, you can have no difficulty in coming to a conclusion as to the abuses, and you can have no difficulty, I think, in coming to a conclusion as to the causes of them; and it will be then for you to consider what power you have or what you will do as to providing a remedy, because I am quite sure that with the great interests which have brought this inquiry here, if you should find, or in the course of the inquiry it should be suggested, that this highway is subjected to these objections, and that there is not now that adequate control in the shape of a Conservancy Commission which there ought to be, to insure the carrying out by independent parties of some great and complete system, some general plan from the beginning to the end, a motion in Parliament for an additional Commission will very soon give you all the powers which are requisite.

Now, Sir, I told you that this was no new point,—that this minority, from a very early meeting of the commissioners, had been holding pretty much the same language which they now hold through me. You will hear that statement made by gentlemen whom I shall think it my duty to call before you, and to present to the cross-examination of my learned friend. I shall call before you every one of the dissentient commissioners. The Act passed, Sir, on the 15th of July 1850; when the first meeting was I do not know. The books, of course, will be laid before you, if necessary; but you will find, Sir, that as early as the 14th of November 1851, Captain Purdo, who was a life commissioner appointed by the Act, raised the question of proper sections of the river. On the 15th of

Mr. Webster.

24th January 1855.

November 1851, by circular, signed by Mr. John Clayton, the clerk, calling a meeting for the 20th, this notice of motion was given by Captain Purdo, "That steps be taken, as "early as possible, to remove Whitehill Point, agreeably to the suggestion of Mr. Rendel." That was one of the matters to which attention had also been called both by Mr. Rennie and by Captain Washington. "That the Commissioners consider the propriety of dis- "continuing the practice of depositing ballast on the shore within the limits of the tidal "high-water flow, and that the lines of the river walls now in course of formation be "extended or retarded so as to meet the lines proposed by Mr. Rendel. That the right- "angled groins now erected in the river be taken up, and that the materials be used in "carrying out the half-tide longitudinal walls proposed by Mr. Rendel." That was a matter on which his heart was very much set, as the proper thing to be done. "That a "longitudinal section of the river be prepared and laid before the Commissioners "monthly." Now, Sir, these were matters that were discussed at earlier meetings,—this is quite early enough for my purpose; but prior to the 15th of November, the matter had come to that shape that Captain Purdo put it in this formal manner, as a notice of motion appended to the circular of the clerk calling the meeting. He called attention to these facts, which I believe all of them, with some additional ones, have been matters of contest by the minority against the majority from that day to the present.

At the preceding meeting, on the 14th of November, at which this notice of motion was given, Captain Purdo spoke to this effect. He said he would "give notice of a motion "which he intended to bring forward at the next meeting,—'That the state of the sands "'at the bar was constantly fluctuating in height, both longitudinally and transversely, "'and that, therefore, he considered it necessary that a longitudinal section of the river "'be prepared and laid before the Board monthly, so that they might have comparative "'data to guide them as to whether the works executed were beneficial or otherwise.' "He produced a plan illustrative of his views, which was submitted to and examined by "the Board, and in the course of the conversation that ensued, Captain Purdo said "Mr. Brooks had suggested that the longitudinal section should be extended up to New- "castle, a suggestion in which he fully acquiesced." Now, Sir, could anything be more reasonable or anything more proper than that this course should be adopted by a man of business like Captain Purdo, a man experienced in these matters, and in earnest in carrying them out, quite independent of local parties, having no local interest, being a life Commissioner, appointed, I believe, by his Grace the Duke of Northumberland, who concurred most fully in the motives of the Shields party,—could anything be more proper or more consistent than this notice for such information? I believe, Sir, although Mr. Brooks assented to it, those who employed him did not, and from that day to the present it has never been carried out.

But, Sir, that is not all. This matter, of the absence of all plans and the perfect state of darkness, so to speak, in which the Conservators were groping by reason of it, had been so pressed upon Parliament by the Shields party in 1849, that the Corporation inserted in the Act of 1850, the present Tyne Improvement Act, this clause, section 33:—"That the "Commissioners shall, with all convenient speed, cause to be made a map of the area "within the limits of this Act, and of any adjoining parts which they think it expedient for "any of the purposes of this Act to include in such map, on a scale of not less than six "inches to a mile, and with such indications of shoals, banks, levels of high and low "water, quays, wharves works, and other particulars as they think expedient for any of "those purposes, or for the general advantage of persons resorting to the port, or con- "tributing to the income of the Commissioners, and shall cause such map to be from "time to time copied, engraved, and published as they think proper, and shall from time "to time cause such map to be revised and such additions and alterations to be made in "and to the same as may be requisite." Now, Sir, the want of something of that kind was one of the great grievances. Nobody but the secret advisers of the Corporation knew where the frontage was or where they might go; but, I believe, not a single step has been taken to carry out that provision of the Act of Parliament. I believe you will hear from Captain Purdo and other Commissioners that they have never been able, at any meeting, to get sections of a sufficient character to enable them to judge of the licences they were granting, and of the liberties they were giving in respect of the land questions, and the encroachments, and the jetties, to which I shall have to call your attention more in detail hereafter. That, Sir, although it looks rather a trifling act of omission, is one of those trifling matters in the control of adverse parties, which persons, who do not wish to have it done, or who do not know the importance of having it done, may allow to go by; but you will find, Sir, that that, coupled with the absence of other information, has been one of the great causes of these defects and encroachments of which we have to complain.

Now, Sir, Captain Purdo and others were objecting to this system of transverse high-water jetties. Mr. Brooks' argument, of course, was the same as had been used in the Clyde when they had them there, which is a totally different case to the present, and in the Tees, which is also as totally different as two rivers can be. His argument was, "Oh, it "improves the channel; you have got deeper water opposite them." True, you have deeper water opposite them, and the sand which was there has gone lower down; but give us a section of the river corrected from time, to time and then we shall be able to prove to you, Mr. Brooks, or at all events to the Commissioners—because to convince a gentleman whose theory is to be upset is not very likely—we shall be able to prove to Parliament, or to the Admiralty, that the defects which we complain of are incident to your mode of

Mr. Webster.

24th January 1855.

dealing with the river, which is most detrimental to the interests of the ship-owners; because you will find, Sir, that this contest which has been going on has been a contest of ship-owning interests and independent interests against other interests of a very different character.

Sir, at the next meeting to that of the 14th of November, "Captain Purdo renewed his "dropped motion, of which notice had been given some time ago. He observed, that the "subject which he had the honour to bring before the Commissioners was of so much "importance to all who are interested in the trade and navigation of the Tyne, that he "feared he was not able to do that justice to it which the interests required or deserved. "Having no wish to go into any detail of the past management of the river, he should "only briefly remark that all the eminent engineers who had been employed to report "and suggest measures for improvements had generally acquiesced in the great principles "lald down by Mr. Rennie in the year 1816. There was no intermediate correct survey "of the river between the above date and that by Mr. Calver, R.N., in 1849 and 1850, "on which dependance could be placed, for ascertaining whether the river was in a better "or a worse condition at present than it was in 1816; this led him to refer to the "recorded evidence of the last-named gentleman before the Admiralty Inspectors, in the "Guildhall, Newcastle, in 1850, when he Mr. Calver stated that he found," without going into the details of the figures, that there was a difference or a loss in cubic feet in the high-water contents of the river since 1816, of 42,766,000; and that the low-water contents were also found by Calver to be so and so, in 1816 so and so, making a difference or a loss in cubic feet of 8,507,000; and also, having reference to the low and high water mark then, and to Rennie's, that there was a loss on each tide in cubic feet of 34,261,000; that the average depth at low water in the deepest navigable channel between the bridge and the bar was found by Calver to be 24 feet 4 inches, by Rennie 25 feet, showing an average decrease in depth of 8 inches; and that there was a decrease in acres of 95¼. Then, Sir, he goes on to renew his motion, and he submits, "that in order to prevent any "further diminution of the tidal capacity of the river, such measures be adopted as will "prevent any more ballast or other materials being deposited on the foreshores between "low and high water marks of spring tides." He says—"Should that be approved of, it "would naturally give rise to another motion, namely, 'that a committee of this Com-"'mission be selected to consider and report the speediest and most economical means of "'disposing of such ballast as has hitherto been delivered at the stations which this motion "'displaces.'" So that they seem actually to have treated this foreshore as stations for ballast, so habituated had they become to this mode of disposing of it. "Should both "these propositions be carried they would not lead one step towards improvement—they "would only prevent the river going from bad to worse. He presumed the time had now "arrived when this Commission ought to decide whether they would steer by the "compass of Mr. Brooks or that of Mr. Rendel. If by the latter, the sooner his half-"tide walls were commenced and carried out with despatch, accompanied with extensive "dredging, as also rooting up all the right-angled groins, modifying the projecting points, "and clearing away every tidal obstruction, the sooner would the river begin to show "signs of improeement. Their first care ought to be directed to improving the depth o "water on the bar, and to encouraging the training of the tidal flow up to the highest "recesses of the river." Sir, you have this gentleman following the matter up as best he could, but you know, Sir, that forcing a matter against an unwilling majority is not a task which even a Commander in the Royal Navy can accomplish.

Now, Sir this gentleman does not want energy in the matter, for on the 30th of December he sends to Mr. Clayton this notice—"To John Clayton, Esq., Clerk to the "River Tyne Improvement Commission. Sir,—In consequence of the alleged want of time "for considering my proposition relative to the depositing of ballast, &c., on the foreshores "of the river Tyne, at our last monthly meeting, on the 11th ultimo, I have therefore to "request you will be pleased to give notice that I intend at our ensuing monthly meeting "to renew the said motion for such discussion as the Commissioners may deem it to "deserve, in order that each member may record his opinion for or against the motion." So that you see, Sir, there was no lack of effort on the part of that gentleman, as to whose skill and ability I will not say a word, because he is well known to many of you, to get this matter properly discussed and properly disposed of, but entirely without success.

At the meeting on the 22d of December another question arose. A question arose before the Commissioners about the removal of an old quay and erecting a new quay in the river, and "Captain Purdo said, as this involved a good deal of land taken out of the river, "he thought this was the time for him to state, that he intended at the next meeting to "renew his motion with respect to depositing ballast on the shore, and infringing upon the "tidal capacity of the river. He merely gave notice that at the next meeting he intended "to propose that no more land should be taken out of the river." A question then arose about the extension of a jetty at Hebburn, and this is a matter upon which a good deal has probably to be said. Mr. Brooks had brought up a report, requesting authority to make certain additional jetties for what he called the improvement of Hebburn Shoal, that is to say, to thrust out these jetties for the purpose of carrying out his theory of river improvement. That was objected to. "Captain Purdo enforced the necessity of proceeding on the settled "practical principle of maintaining the full tidal capacity of the river, and increasing the tidal "flow longitudinally, as pointed out in the plan of Mr. Rendel; clear away the road for the

Mr. Webster.

24th January 1855.

" tide, and he would answer for it there would be no sand banks." Captain Purdo says, give up your jetty system, adopt your half-tide wall, or even any wall if you like, and then you want no dredging or anything of the kind, having regard to the loose character of the soil of the Tyne. Observe how this gentleman is disposed to do all he can to get things carried out. " Though, however, he considered the course proposed by Mr. Brooks was " entirely contrary to his principle, as he conceived they were not beginning at the right " end, and that the current produced by the jetties would not remove the shoal, but only shift " it from one part of the river to another (an opinion in which several members concurred), " he was nevertheless willing that the plan should be tried, but let it be clearly understood " simply as an experiment which must be carefully watched, and Mr. Brooks must furnish " them every month with a plan of the state of the shoal, and exhibit the effect produced, " and then they would know how it was going on and see where the shoal went to." Now, Sir, can anything be more reasonable than that? But observe the course of tactics of Mr. Brooks in support of his theory (Mr. Brooks will know that I do not use the term offensively), or the course of tactics of those who were determined to keep Mr. Brooks in power because it suited their views. It is represented to be an experiment. Well, says Captain Purdo, let it be an experiment, only let us have your plans to see and test your experiment; do not let us be kept in the dark as we are now. Therefore that authority was given to put this up as an experiment; but the experiment once begun, went on, and there it is still, and I believe it has gone on since to a much greater extent. And there has been a good deal of that—I was going to say false pretences—I do not use it in an obnoxious sense, but a good deal of that representation, let us do this as an experiment, let us have just that little bit of land, that foreshore, and we shall want no more; but when they have once got their foot upon it the thing has grown up, jetties have gone on, the land has grown up, and I have no hesitation, Sir, in saying that you will be satisfied that, whether right or wrong, the proceedings of this majority have been conducted with that species of decoy, Give it us as an experiment. They never showed either the failure or the success of the experiment, but the matters were so carried on that the result intended to be accomplished, namely, taking land for the benefit of the applicants and abstracting tidal water at the expense of the river fund, has been attained to their hearts' content.

Now Mr. Straker, another and a very leading gentleman, who will be called before you, and who, if not the father, at all events had very much to do with this movement at Shields, objected at that meeting to which I have referred, and at the next to this proceeding of athwart jetties, and he has denounced it from that time to the present, and you will find that this gentleman and the minority, more or fewer of them, have invariably denounced this system of dealing with the river, and complained that they could get no sections nor any information to enable them to test it, but matters have gone on as Mr. Brooks or those who employed him wished.

Connected with this is a complaint which has been urged, as to the way in which the works have been conducted, because of the deposit of the ballast; owing to the way in which the work was done for which the Commissioners paid, the ballast has been so deposited as to be washed out into the river, and to that you will find repeated attention has been called. On the 6th of January 1852, Captain Purdo called attention to the state of the water on the bar. At that same meeting of the 6th of Jannary, Sir, the subject of this experimental Hebburn jetty was renewed by another gentleman, Mr. Stevenson. " Mr. Stevenson then moved, 'That previous to the proposed extension of the jetties at " 'Hebburn Quay, the engineer be instructed to make a series of soundings of the river in the " 'neighbourhood of Hebburn Shoal, to be repeated from time to time along the same lines; " 'the cross sections to be those numbered 112 to 153, on Rennie's and Calver's plans—and " 'that each set of observations be laid before the first following meeting of the Commis- " 'sioners.' Captain Purdo seconded the motion, which was adopted without discussion, it " being understood that the first section would be made before the proposed extension of the " jetties was commenced." The majority might very well assent to that, for if they had the means of preventing the thing being done, there was no great harm in allowing Mr. Stevenson and Captain Purdo to take the resolution without opposition; " Captain Purdy " then brought forward the motion of which he had given notice—'That in order to prevent " 'any further diminution of the tidal capacity of the river, such measures be adopted as will " 'prevent any more ballast or other materials being deposited on the foreshores between low " 'and high water marks, spring tides. That a committee of this Commission be selected to " 'consider and report the speediest and most economical means of dilposing of such ballast as " 'has hitherto been delivered at the stations which this motion displaces.'" Now, Sir, both as regards the sections, and as regards any and proper secure means of disposing of the ballast in other ways than depositing it between high and low water mark, neither Captain Purdo nor Mr. Stevenson, although the motion has been repeatedly renewed, has ever been able to get any conclusive or satisfactory result.

I have already intimated that this ballast question is one whiah lies very much at the root of the encroachments, and the deterioration of the channel to which we have referred, and it operates in this manner. Supposing parties are frontagers, and can get a good space of the river, they want to make land. Supposing they get a good payment for the deposit, they do not care how much washes into the river. In the one case they get the land in the other case they get the payment, and the Commissioners have either to allow the river to remain in the state consequent upon the washing in of the ballast, or to dredge it out again, and you will find that although the system of dredging has been applied

Mr. Webster.

24th January 1855.

simply for removing temporary obstructions, there has been no less a sum of money than 11,600*l.* expended during the last three years upon that dredging operation for temporary purposes only, whereas Mr. Brooks in earlier years asserted that dredging was wholly unnecessary, and which dredging, we assert, has been of no other effect than just to prevent matters from getting so much worse, that if it had not been done, the failure of his system would have been obvious to everybody. You will also find that having reference to the payments which have been made for ballast during the same period of about three years, there has been a sum of more than 13,000*l.* paid by the Commissioners to parties for the deposit of ballast. I do not pledge myself to those precise figures. Mr. Stevenson will give you the details. Of that 13,000*l.*, 5,500*l.* ought to go to the credit of the land account for making land. There has been 5,643*l.* for river improvements proper; but of that, more than 4,000*l.* ought to go to land, so that you have this state of things as the consequence of the system which has been pursued; the dredging costing 11,000*l.*, merely for temporary purposes, in consequence of the washing in of the ballast, and of the jetties of Mr. Brooks removing shoals from one place to another, and creating new shoals, and 10,000*l.* for making land; the actual sum for river works proper being something not amounting to more than a very few thousand pounds. Therefore, the way in which the Commissioners have allowed the ballast to go, is a direct premium on encroachments upon the river, and a direct premium on land-making, as in point of fact you will find, having reference to the quantity of land which has been abstracted, and to this fact, that the ship-owners have submitted to additional dues—that the ship-owners are paying at the present moment a premium for the land which is made into property for the Corporation of Newcastle and the land-owners upon the shore.

This objection, as regards the ballast, of which Captain Purdo had given notice, was made the subject of a motion by Mr. Stevenson, which was repeated on the 15th of May, on the 12th of June, and the 1st of July. Mr. Stevenson, who had concurred with Captain Purdo in taking up this measure, made a report upon that system. He examined into it, and he will give you such information upon it as you may think necessary. This report was considered and postponed, which is a very convenient way of dealing with an inconvenient question. The ballast system of deposit was too attractive and too profitable, under the circumstances which you will hear of, to be easily given up. Mr. Brooks also, on the 14th of August, reports against hopper ballast barges. I have no doubt he was sincere in that opinion; he had an opportunity of examining the merits of it; but this is only part and parcel of the general system of a fortunate concurrence of the views of the engineer with the interests of parties against the public. The Commissioners pay really for the land—they pay for the ballast, and the land ought to belong to them; and nothing will ever be done in ensuring the conservancy of this river, as regards the prevention of creating land at the public expense, which is the expense of the ship-owner, placing the ship-owner as against the land-owner, and making the ship-owner pay for that which the land-owner gains—except by the most rigid prohibition against the system of depositing ballast at all between high and low water, excepting under such regulations as where land is to be made under proper authority. These questions of making land for interested parties are of far too great importance, as all the experience of the Tidal Harbour Commissioners shows, and as gentlemen conversant with these matters know—they are far too delicate questions, so to speak, to be left to the control of local commissioners, or parties locally interested; and you cannot possibly have any remedy for this state of things, which has been complained of from the very first until now, except by the most stringent parliamentary prohibition, and except it be required that land so made shall become the property of the public, under proper restrictions as regards the increased value of the adjoining land-owners' property, and on paying such price as a deterioration of value by the alteration of the frontage may necessitate.

Now, Sir, this is no fancied thing. I remember that Mr. Armstrong, the Chairman of the River Committee, when examined before the Committee of the House of Commons, was cross-examined by my learned friend, Mr. Serjeant Wrangham. One of the causes of the complaints made was, You get that 27,000*l.* a-year from ships in Shields harbour; did you ever spend anything upon Shields harbour? Oh! dear no, that is quite ridiculous. He treated it as a joke.

(*Mr. William Armstrong.*) You are quite wrong; I was not examined.

(*Mr. Webster.*) I beg pardon, there are two Mr. Armstrongs: there is a treasurer Mr. Armstrong. It might have been Mr. Clayton, he was examined as a witness, or somebody equally distinguished, though that could not have been, because gentlemen who know Newcastle, know that there is not another Mr. Clayton in the world. But a gentleman of note, whom the Corporation of Newcastle adduced as a witness in 1849 against the Bill, treated as a joke the idea that they should spend money at Shields, or on any other object than for their own purposes. I doubt not they were proper corporators—they were well imbued with the notion of the dignity and privacy of corporate property, and they thought that they had as good a right to an estate in land made out of river funds as in land which their own labour and that of their forefathers had acquired for them.

Now, with regard to the encroachments, (I call them encroachments,) the land-making, as shown upon the map. I will not trespass upon your time by going into the old cases of land making, but I shall show you that that which was complained of in 1849 as land-making, and made a ground of complaint against the Corporation, whose funds were so properly applied, as this gentleman thought, that it was ridiculous for anybody of common sense to

Mr. Webster.

24th January 1855.

think otherwise, has been continued up to the present time. It has gone on in precisely the same satisfactory manner to the owners of private property, but unsatisfactory to the gentlemen of Shields, and those who pay for it. But, Sir, we have a new case, and which I shall go into in detail, as illustrating the principle. It is the case of Messrs. Palmer and Brothers, gentlemen of great distinction, who figure before you in the proceedings of the Commissioners and in Parliament, sometimes as Palmer and Brothers, and sometimes as Bowes and Company, I believe a most eminent and distinguished firm. I believe the Hon. Member for Gateshead, and Mr. Nicholas Wood, and other aristocrats of this district, are partners in it, or interested in it, either directly or indirectly. They enjoy the professional advice of Mr. Clayton, and I believe of Mr. Philipson.

(*Mr. Clayton.*) You are wrong there; I am employed for their landlord, Mr. Cuthbert Ellison.

(*Mr. Webster.*) That is another case. I believe Mr. Philipson is concerned for these gentlemen. Mr. Clayton is the Town Clerk of Newcastle and the Clerk of the Commissioners, and Mr. Philipson, a very able and excellent professional man, is also a Commissioner, and their professional adviser. There is no objection, of course, to gentlemen doing the best they can for their clients. Messrs. Palmer and Brothers made application, the precise date of which I have not here, and it is not very material (it will be spoken to by the witnesses), for a licence, as it is called, to make land. The Corporation of Newcastle have hitherto asserted, notwithstanding the transference of the conservancy powers, that they have a right to licence dues for making land. Now, Sir, that may be a question which will have to be considered in another shape hereafter; but inasmuch as the Corporation never had any rights over this river, except as conservators, and inasmuch as the conservancy rights have been transferred in their entirety to the new Commissioners, these payments, which amount, I believe, to not more than 14*l.* a year, which the Commissioners have claimed to be their right and as belonging to them, are a matter of no importance either to the Corporation to claim, or to the Commissioners to have, except for the connexion which they have with other purposes, as the making land and foreshore. Messrs. Palmer applied for this licence; it was objected to, and a plan was produced, but a plan, as I am told, which merely showed the direction in which the wall was to go. Mr. Brooks, not having complied with the requisitions which were made to him, or with the Act of Parliament, that there should be a proper plan showing the foreshore and the walls, that everybody might judge of what was going to be done, there was produced for the purpose of this particular occasion some plan; in whose possession it was I do not very well know, but that led to a question as to the quantity; there was a considerable discussion, and meetings took place. I think the first meeting was about April 1852. On the 13th of May permission was given to encroach; a pencil line was shown upon the plan, and a report was ordered (I pray your attention), on the 13th of May, of the area of the enclosure and encroachment intended to be made. No information was given upon that till the 27th of January 1853, nearly a year following; but the works had been going on all this time, and had been done, and then it was stated that $5\frac{9}{10}$ths acres was the quantity. Owing to the uncertainty in which all this was left, Mr. Philipson asserted, on behalf of his clients, that the quantity actually granted amounted to considerably more; I think at one time it was stated at 15 acres, at another time as much as 20 acres; it has in the result led to an enormous encroachment of the most serious character, which, if it could be justified at all, ought never to have been permitted except under Act of Parliament, or under the most stringent regulations of the Admiralty, seeing the profit which is derived from it.

Now this appeared, I was going to say, so flagrant a thing (and it is certainly an extraordinary thing, not known elsewhere in the world, that encroachments of this kind should be allowed by private parties without the control of Parliament or of the Admiralty—it only exists here under the peculiar circumstances of the case, the great power of the Corporation of Newcastle and the difficulty with which any matter is got at at all), that it was made the subject of inquiry in Parliament, and of a Report by Mr. Calver, and to that I pray your attention. It is a Parliamentary Paper, printed by the House of Commons on the motion of Mr. Lindsay, on the 16th of June 1854. Mr. Osborne, by direction of the Admiralty, writes to Mr. Calver, "I am commanded by my Lords Commissioners of the "Admiralty to forward to you a plan of a staith proposed to be erected by Messrs. Palmer, "Brothers, near Jarrow, on the south side of the Tyne, and to direct that you will take "an early opportunity of examining the site and report your opinion on it." I think I omitted to mention that the first application was for a new staith. They also applied for permission to build a wall, and a view took place, which resulted in requiring the area of the enclosure and a proper plan to be furnished. Mr. Calver examines this, and he reports that to the staith there is no objection, that it is a proper staith. He says, "I am of "opinion that if their Lordships permit the continuance of the staith, they may also sanc-"tion the extent to which it reaches beyond the black dotted line on the accompanying "plan, said to make the line of river wall sanctioned by the River Tyne Commissioners." I do not know whether Mr. Calver was aware of the numerous discussions which had taken place by the Commissioners as to the want of a plan, and as to the precise line of it, but probably that observation points to this fact, that there was a dispute as to what the real nature of the grant was. Had the structure been situated upon a concave shore, where the impact of the stream would have determined the channel close along it, such a projection would have been a serious hindrance to navigation, but in the present case no such objection applies, for the reach upon which the work abuts is comparatively straight, and

Mr. Webster.
24th January 1855.

the channel may be assumed as equidistant from either shore. In further obeying their Lordship's directions to "add any remarks which may occur to me relative to the interests "of navigation in that part of the Tyne," I would mention that the staith at Jarrow is in the immediate vicinity of an encroachment upon the tidal space of the river in actual progress, that such obstruction amounting (when completed) to five acres, is to be considered as the first stage only of a more extensive enclosure, the area of which, judging by the preparations which have been made for it by full-tide transverse jetties and other projections, will amount to about 65 acres. I would particularly invite their Lordships' attention to the fact that this contemplated obliteration of tidal space is upon a general convex shore, so that the pleas usually urged in justification of reductions of the sort are here entirely wanting. This is just above Jarrow Quay, between Jarrow and Hebburn, upon the plan.

(*Mr. Armstrong.*) That was the subject of an Act of Parliament for making docks, I think, last year.

(*Mr. Webster.*) No, Sir, the other side.

(*Mr. Clayton.*) No, it is on the same side lower down.

(*Mr. Webster.*) That has nothing to do with this, Sir; that was Jarrow Slake. You will find, Sir, that it is marked "Palmer" (*showing the same*). "If their Lordships "determine upon preserving this space for the public as a portion of the tidal receptacle "of the Tyne, immediate action is necessary, and the most simple means would appear to "be to order the removal of all the transverse obstructions above alluded to, and to see "that the Tyne Commissioners, in carrying out their channel boundary in this district, "confine their training wall to half-tide height. Still, from the knowledge I have acquired "of the practices usually pursued upon this river, I cannot say that this even would be "effectual as a preservative measure, unless aided by unceasing vigilance on the part of "their Lordships. I cannot, however, submit any definite recommendation upon the "whole case without entering into details for which I have no warrant in their Lordships' "instructions. In conclusion, I have only respectfully to add, that if the River Tyne "encroachments (as a whole) are allowed to be consummated, I trust that some means may "be found whereby the Crown may extend its ownership over the lands thus formed, the "extent of which may easily be determined by Rennie's Survey as a basis, and that the "funds accruing from them may be converted into a permanent source of river revenue "for the employment of means to restore to the Tyne its original tidal capacity. While "such a measure would be a fit termination to long-continued acts of local abuse, its moral "effect would also be extremely useful in assisting their Lordships in the future con-"servation of the other tidal streams of the United Kingdom." Now, Sir, this which Mr. Calver intimates with reference to the course of action in the Tyne, you will find is a matter that the minority of the Commissioners insist upon, as being one of the difficulties with which they have had to contend, namely, these experimental jetties which have been put up, and these licences for a small portion extended in the way in which Mr. Calver anticipates that this case of Palmer will be extended.

Sir, Mr. Osborne sends further instructions on the 29th of November to Mr. Calver, and says,—"Referring to the latter part of your letter of the 23d instant, I am com-"manded by my Lords Commissioners of the Admiralty to direct you will take an early "opportunity of making, on a suitable plan of the Tyne, the exact position and extent of "the encroachment on the tidal space of the river which you mention, and dot in the out-"line of the larger area it is apparently intended to enclose. Also to state who are the "parties making this enclosure, and whether, as far as you are aware, it is done with the "consent of the Tyne Improvement Commissioners. Also, whether, in your opinion, "the work is objectionable on any other account besides the exclusion of tidal water, "and, if so, to point out the probable ulterior effect on the navigation of the river. Their "Lordships will be prepared to take into consideration any recommendation you may have "to submit as to the mode of preventing or dealing with similar enclosures on the Tyne "which may be attempted in future."

Then, Sir, Mr. Calver accounts for the delay which has arisen, and refers to their Lordships' communication, "Upon the accompanying lithograph, which is a reduction of "the shores of the Tyne from the Admiralty Survey of 1849," that is, the one which has already been referred to, "I have marked in distinct characters the enclosures alluded to. "The light pink is the encroachment of $5\frac{9}{10}$ths acres now in progress at Jarrow." It is on the 17th of December that Mr. Calver writes this, and you remember, Sir, that it was not till January that the Commissioners were able to obain from Mr. Brooks what was the extent of the then encroachment. In the preceding May they had required the Engineer to furnish the extent of the encroachment, but they could never get any return till January, which was a month after this Report of Mr. Calver.—"While the deeper pink "marks that portion of it already completed, the black dotted line embraces the whole "area apparently intended to be enclosed, amounting from Jarrow up to the letter C, "to 65 acres, and to the letter D, to 85 acres. The transverse blue lines represent full-"tide groins and other kindred works, the scaffolding as it were for making the enclosure. "The whole of the space thus marked off from Jarrow to above Hebburn inclusive, on the "southern or right bank of the river, is upon a convex shore." Then he says that the parties are Palmer, Brothers, and Company, having parties of local influence among them. Then he refers to this having been made the subject of an inquiry in the House of Commons, as reported in the "Morning Post" of the 17th of March, and he states what

Mr. Webster.

24th January 1855.

I have already called your attention to as appearing upon the proceedings of the Commissioners. He mentions the answer of Mr. Wilson, the Secretary to the Treasury, in the House of Commons, this matter having been publicly referred to by Mr. Macartney. Mr. Wilson is said to have replied that "he believed that the Commissioners of the Tyne "had given a privilege, simply a temporary use of part of the Tyne, to Messrs. Palmer." Now, Sir, I must say if really the majority of the Commissioners think it right to treat a case of this sort in that manner, that they speak of jetties as only experimental, that they allow this as only an experiment, and that they grant privileges of this kind on the foreshore as temporary, whereas it is merely the scaffolding or the foundation, as Mr. Calver calls it, of complete encroachments, which they do not announce as their intention at the time when the application is made, it is quite sufficient to justify a minority in using, perhaps, on some occasions, the strong language which they may appear to have done in the proceedings of the Commissioners. "In the application made by the "firm to the Tyne Improvement Commissioners, reported in the 'Newcastle Journal' of "November 6th, 1852, it was distinctly stated that it was intended to convert the space "applied for into solid land, by the deposit of ships' ballast, to enable the Messrs. Palmer "to carry on their business as shipbuilders. One of the members of the firm also "admitted to me, during my visit to the Tyne on the 21st ultimo, that they had obtained "from the proprietor of the abutting property a lease of the spaces A and B in addition, "which spaces they were proceeding to convert to the same purpose, until prevented by "the Commissioners for informality. As all such enclosures hitherto made in the Tyne "have speedily been covered by buildings, and absolutely held by each grantee as part of "his private estate, thus putting the space so enclosed beyond the control of the Admiralty "and the Commissioners, the term 'temporary' should not have been applied to this "enclosure at Jarrow in the statement made to the House. This encroachment is being "carrried out with the consent of the Commissioners, although I am informed that their "leave for it is confined to a resolution recorded in their minute-book, and that no "formal licence has been signed by them up to the present time. I understand that this "transfer of public rights for private purposes was accompanied by the usual condition; "viz., 'that the Messrs. Palmer are to remove or alter the river line on being "required to do so by the Commissioners;' for it is deserving of special remark, that "although more than three years have now elapsed since the Commissioners entered upon "their duties, the very first stage of river amelioration, viz., carefully projected boundary "lines for channel improvement, is yet an open question."

Then he goes on to say.—"Thirdly, I have two decided objections to this enclosure, "and believe it will inflict a twofold injury. My remarks will be understood as referring "to the entire space from Jarrow to Hebburn inclusive. I object to it, first of all, because "it will involve a wholesale rejection of tidal water. My reasons for this opinion are "based, partly upon facts obtained from the Tyne itself, and partly upon corroborative "evidence gleaned during my long employment in the Surveying Branch of the Naval "Service. Without here entering upon the proofs I have to offer in support of the soundness of this view, I may remark that it is fully confirmed by an analysis of the opinions "of those members of the engineering profession who have been considered most worthy "of confidence, for it may be proved beyond cavil that they considered all inroads upon "tidal surface and space as an unmitigated evil in any estuary, under which category the "Tyne falls."

Then Mr. Calver refers to matters which I may have occasion to refer to hereafter, and which I will just read in order to dispose of them at once. He says,—"Embankments "are admissible in some cases of magnitude and conformation, and inadmissible and "destructive in others; it is of the last importance that the distinction between the cases "should be fully recognised. I would also refer their Lordship to Mr. Walker's Report "of the 21st of January 1845, upon encroachments on the estuary of the Tay, and to the "history of operations upon the Clyde and the Dee, as affording much valuable information upon this important subject." Then, Sir, Mr. Calver refers to a report by Captain Vetch, also made upon the subject of the Tyne. He assigns a number of reasons in his report for alleging that this was a case in which a licence ought never to have been given; and he refers to the constitution of the Tyne Commission, the ruling majority of the Commission being the representatives of Newcastle and Gateshead. And he says,—"The members of the Commission, though generally unacquainted with the matters upon "which they are called to deliberate, yet systematically carry out the most extensive "works without giving the Board the notice required by law; and I can only urge upon "their Lordships the opinion lately expressed by Captain Vetch, R.E., of the Harbour "Department, that 'if the Admiralty have any jurisdiction in the Tyne, there is no "'navigation where the exercise of it is more required.'"

Then, Sir, he recommends, which I trust will be a matter which you will also take into consideration, "That the Commissioners of the Tyne be immediately prohibited from casting any "more imported, dredged, or other material into any portion of the bed of that river, and "that for the future they undertake no more works within the limits of the tidal flow "without the previous sanction of their Lordships." Now, Sir, that prohibition, recommended upon this authority and adopted by the Admiralty, of placing dredged or other materials upon the foreshore of the river, is one of the matters which you have been already informed was insisted upon by Captain Purdo and other members of the minority the very first time when this question arose. Then, Sir, he concludes with the necessity of local

Mr. Webster.

24th January 1855.

government and supervising authority, which is not a matter upon which I think it necessary to occupy your attention further.

Now this matter of Palmer's encroachments, and the inability to get any information, led to a good deal of altercation at the meetings of the Commissioners, and on the 8th of September a resolution on the subject was come to. Resolutions at preceding meetings which I have passed over had referred to the question of ballast and hopper barges. I do not propose to occupy any more time upon that, but I come to the meeting of the 8th of September, I cannot at the moment lay my hand upon the resolution, I have it thus upon my notes, it was the resolution of a meeting of Commissioners that no further application for land should be received except accompanied by a plan with different coloured ink, showing precisely, both as regards section and plan, the nature and extent of the encroachment. But then, so far as regards the Messrs. Palmer, the mischief had been done. And, Sir, this curious circumstance occurred here, nobody knew how this encroachment grew up. Messrs. Palmer did not know that it had grown, but there it was; Mr. Brooks did not know; at all events the Commissioners did not know; but somehow or other, nobody knowing exactly how this piece turned out to have been made into solid land, and therefore the licence had answered fully the object of the parties attaining it.

At the upper corner of the same spot is the property of a Mr. Leslie, who is interested I believe with Mr. Ellison, who is represented by Mr. Clayton. There an application had been made for a licence of a similar kind, and there too full-tide jetties and land had grown up without anybody knowing exactly how. On the 13th January 1853 these were in question; and this really does show a most extraordinary state of things in the management of this Commission. The Messrs. Leslie's property, Sir, is at the east end of Hebburn Quay, at the letter C, you will observe the size and extent. In fact, the encroachment of Messrs. Palmer and the encroachment of Messrs. Leslie include the portion of that bend of the river. On the 13th of January Mr. Brooks brought up a report commenting upon the success of those jetties, which might or might not be the case; at all events he afforded the Commission no materials for ascertaining the truth of his statement. At that meeting the question of the jetties at Hebburn was broached, and a majority of 7 to 6 was found to vote against them; but notwithstanding, Sir, a vote of the Commissioners of 7 to 6 against the putting up of any additional jetties at Hebburn, jetties got up some how or other. So that here you have this extraordinary state of things, Messrs. Palmer and Brothers applying for a licence, getting some sort of a licence, nobody knowing exactly what. Land growing up (because there was considerable discussion as to how high the piles were, or who ordered them), the Commissioners passing a resolution against jetties being put up, and yet jetties being put up afterwards. Sir, if that be so, if my instructions be right and my copy of the Minutes be right, that is a matter upon which there can be no doubt at all. Is not that, Sir, a state of things which really calls for the most vigilant inquiry on behalf of the public, on behalf of the Admiralty, and on behalf of the Commissioners appointed for that purpose, and which justifies to the fullest extent the course which the minority have thought fit to take?

On the 27th of January a report was presented on the effect of some land floods which had taken place, and it was then that the engineer made a brief report on the question which had been referred to him in these words:—"I find that the bed of the River Tyne and fore-"shore proposed to be enclosed under the licence to Messrs. Palmer at Jarrow will "embrace an area of $5\frac{9}{10}$ acres." So that it was not till the 27th of January, more than eight months after he had been required by the Commissioners, without opposition in that case to furnish particulars of this encroachment that this was furnished. It was there stated at $5\frac{9}{10}$ acres, but which was the foundation of this abstraction to the extent of 85 acres. Then, Sir, that was the subject of a motion of Commander Purdo, and after the discussion, which took place with reference to that matter, a resolution, or rather a conclusion, was come to, "That the engineer was at liberty, under the terms of the arrangement of the "previous meeting, to make temporary use of the jetties, if demanded by circumstances." It is not to be explained how, notwithstanding the previous precise Resolution, these jetties grew up, leading to the consequences to which I have referred.

On the 10th of March, on the 30th April, on the 12th of May, the 18th of May, the 9th of June, the 14th July, and the 27th of July, observations upon this subject, or others immediately connected with it, and the propriety of half-tide training walls as against these transverse jetties were made by different individuals, but without any conclusion at all, they being either met with a simple negative, or disposed of by procrastination and delay, in such manner as to defeat the purposes of the minority, who wished to prevent this species of encroachment, excepting under such control and regulations as I have mentioned.

On the 11th of August a resolution was come to, which is curiously illustrative of the same state of things. A motion was made by Mr. Robinson. I understand Mr. Robinson is a gentleman of South Shields, who has generally acted with the minority, but is not one of the six.

(*Mr. Clayton.*) You have decreased your number, you have only five, one is thrown out.

(*Mr. Webster.*) That, Sir, will compel me to ask you for an order that he shall attend. He is a gentleman of the name of Lamb. I believe he is very much a man of peace. However, the fact is that there were six who signed the original letter, and there are now five who actively support the statements contained in it. Mr. Robinson was a gentleman who generally, or very frequently, acted with them, and he moved upon that occasion, "That "the expenditure of the funds of the Commission on full-tide walls should be immediately

"discontinued." He also reverted to the question of obtaining some means of carrying ballast out to sea by hoppers, which was a matter that had been referred to several times, but nothing, in effect, had been done upon it.

On the 7th of September, Sir, and on the 27th of September, this attempt was renewed. "Mr. Robinson further moved, 'that the expenditure of the funds of the Commission on "full-tide walls should be immediately discontinued.'" Mr. Stevenson seconded the motion, and there was a division upon it of 4 against 6. The expenditure was therefore allowed to go on.

On the 8th of September, the 13th of October, the 26th of October, and on other dates, discussions took place as to the raising of these piles on Messrs. Palmer's land, and this alleged making of land which nobody could account for. I do not pursue it in detail, because there is no doubt about the thing having been done. Our object now is to obtain a remedy to prevent it in future.

On the 8th of December, Captain Purdo had placed another resolution upon the books, with reference to this question of the abstraction of land. He had before asked, but could never get any information as to the quantity of land actually abstracted. He had applied to Mr. Brooks to furnish it, and on the 8th of December he moved formally for it; but that, like much other information which it was not convenient to give, was never given; and I believe up to the present moment the engineer has either been too much occupied, or been acting under other directions, and the return has never been given. But on that occasion Mr. Brooks, who was appealed to, stated that it was always the intention of the Corporation to make land,—he did not at all conceal that that was their object in doing it,—and at that same date another gentleman, a Mr. Allhusen, also called the attention of the meeting to a very important question as to the foreshore. On the 8th of December a resolution of the Council, passed in May 1843, was read, in which it was resolved to proceed with Mr. Brooks' plan of jetties at Willington and Jarrow, being Corporation property. "And "Mr. Brooks urged that it was always the intention of the Corporation to make land by "means of the jetties, and thus compensate Mr. Brown and the other landowners for the "injury caused by the other works of the Corporation. Mr. Straker considered that "nothing had been shown to justify the proceedings of Mr. J. Palmer, and pressed his "motion, which was seconded by Captain Purdo." Now, Sir, that discloses a very curious state of things, a resolution of the Council in May 1843 respecting this matter, and Mr. Brooks, the engineer of the new Conservancy Commissioners, alleging that it was always the intention of the Corporation to make land, and that that was the course they adopted for compensating persons who had sustained injury from other causes. Sir, was such a state of things ever heard of in a navigable highway of the kingdom, proceeding without plan, without the authority of Parliament, or without the authority of the Admiralty, or of anybody but the mere will of the Town Clerk? On that occasion Captain Purdo moved, pursuant to notice, "That the engineer be directed to furnish a report, "showing the number of acres of land that have been abstracted and are now under the "operation of being abstracted from the tidal space (by the operation of the full-tide walls "and transverse jetties), subsequent to the year 1840, on each side of the river, between "Bill and Whitehill Points, including the space sanctioned by Act of Parliament for the "Northumberland Docks,"—those are the docks at Hay Hole,—"distinguishing that which "is already solid land from that which is under the operation of silting and filling up." Which motion was carried by 6 to 5, but, Sir, although carried, it was never furnished—it shared the fate of other resolutions. It was matter of indifference whether they were carried or not, if there was the intention that they should not be complied with.

On the 19th of December the application which led to the result to which I have referred, viz., the operation of that encroachment of Mr. Leslie, at the extreme point of that convex portion of the shore of 85 acres of land, was brought before the Commissioners. What, Sir, do you think was the application? To be permitted to harden the surface—that was the original application on the 19th of December—to be permitted to harden the surface to the level of the half-tide walls. Sir, that is another phase of the way in which these things have been done by accident—jetties only temporary in one case—rights of another class temporary in another; here is an application to harden the surface to the level of the half-tide walls, which was a very harmless application. It, however, grows up to the full-tide wall, and is of the same class as the other encroachments. That application was confirmed on the 12th of January; and on the 20th of February Captain Purdo called attention to the fact of his motion respecting the quantity of land never having been complied with, and it was excused by the Clerk of the Commissioners on account of Mr. Brooks' engagements and inability to do it. Why, Sir, if a proper plan had been prepared, the Commissioners, having in their own control, from the plan accompanying Mr. Rendel's Report, the means of furnishing it, there never could have been any difficulty or uncertainty as to the way in which this land was dealt with.

On the 23d of March, Sir, Captain Purdo brings this question of the return again before the Commissioners; and now another gentleman appears on the scene, Mr. Rayne, I believe a very active member of the Corporation of Newcastle. What was his excuse for it? Mr. Clayton's had been, that Mr. Brooks could not do it, from being too much occupied. Mr. Rayne moved, "That this return should not be made—that it would be dangerous." Dangerous for what purpose? However, this return, which had been ordered, was, on this plausible suggestion of Mr. Rayne, refused. Here was Captain Purdo, who had been living in hopes that he should get this information, which had been promised by order of the

Mr. Webster.

24th January 1855.

Commissioners so long ago, at last met by Mr. Rayne moving the direct negative, that it would be dangerous, and he is without it to the present day.

On the 4th of May 1854, the question of Mr. Leslie's encroachments was again brought up, and there was a motion of 7 to 6 upon it, which led to no effective result. On that occasion a little addition was made to the application which had been made on behalf of Mr. Leslie, or of those interested in the Ellison estate, to harden the surface. He gets a piece more given to him by a majority of 7 to 6.

On the 11th of May, Sir, another important motion takes place, which is made by Mr. Stevenson, "That the present system of attempting to improve the river by the syste-" matic exclusion of tidal water by means of jetties and full-tide embankments, be imme-" diately abandoned." Here appeared to be 6 to 6 for that, and it was negatived by the casting vote of the Chairman, the Chairman being the Mayor of Newcastle. On the same day, Mr. Rayne, who had disposed of the motion of Captain Purdo in the way that I have referred to, moved, "That in future no ballast be deposited behind the groins except " chalk and chalk rubbish, and ballast dredged from the river." Now, Sir, what do you think was the fate of that motion? Mr. Rayne had some notion, I suppose, that this system of ballast was getting too bad; however, he thought better of it, or was advised better of it, and his motion was withdrawn. So that you have a gentleman, who when he is in an independent frame of mind, makes a motion apparently in the same line as the minority; but he either sees that it is dangerous, or some suggestion is made why it should not be carried out, and that motion is withdrawn, or rather another is substituted for it with respect to river lines, which is a way of avoiding it.

On the 29th of June a motion was made by Mr. Stevenson of a very important character, with reference to the interests of this conservancy, which was in these terms, "That seeing " that the conservation of the tidal area and capacity of the Tyne is their first duty, and a " great public trust committed to the Tyne Improvement Commissioners, the present " system of alienating the foreshore of the river to the owners of the adjacent lands, " whether corporations or individuals, ought at once to be discontinued by the Commis-" sioners." That, of course, was a desperate attempt, but it would be really suicidal to the course which the majority had pursued, and it was rejected, as might have been expected, by 9 to 5.

Shortly after that, Sir, on the 13th of July, there was an allusion to the application which had been made to the Corporation to refund the licence dues which they had received in respect of foreshore rights in their character of conservators—

(*Mr. Clayton.*) No, I beg your pardon; as owners of the soil.

(*Mr. Webster.*) Yes, that is the legal crotchet, which the excellent Town Clerk, who looks so well after the interests of Newcastle, has always asserted, that they are the legal owners of the soil of the river. Sir, if they were so, inasmuch as they never had any rights, excepting the conservancy rights, it is high time they should be dispossessed of that property, because they are now no longer either conservators, nor have they any other connexion with it excepting the private estate which they have made out of the river fund.

I have now, Sir, gone through, I fear in too great detail, (although I might have done so at much greater length,) the proceedings which have taken place, but I felt called upon to support the course which the minority have taken, in insisting from first to last upon those principles which ought to have governed the Conservancy Commissioners, but by which they have refused to be guided, and which has led to the encroachment and deterioration and the non-improvement of the river, which we assert, and fearlessly assert, to be the case. The question, Sir, which up to that time had mainly agitated the Commissioners, was the policy of adopting half-tide training walls, in lieu of these transverse jetties, which were carried up to high water, the effect of which was disturbing the true current, and the result of which was making land in the manner described. That was done, Sir, from a conscientious adherence to Mr. Rennie's Report: and I will now call your attention to the passage in Mr. Rennie's Report upon which that is founded. That Report is printed in the Admiralty Inquiry of 1849. At page 108, Sir, of that Appendix, (and this paragraph will be material with reference to the misrepresentation made in one of the letters which I shall have to comment upon, of the majority, sent to Sir James Graham in answer to the memorial of the 3d of June), he says,—"The lines of contraction laid " down by me are not, however, regular; they are always wider where the turns are, and " in general the river has been laid out of a greater width where the greatest number of " vessels generally lie, in order that proper room may be afforded for others to pass and " repass them. And as vessels which lie in the river to take on board cargoes, not only " occupy considerable space but also occasion eddies, there is more space required for the " tide-water to pass them than in places where vessels do not generally lie. It is possible, " however, that experience may prove that these spaces should be still further contracted. " The mode of contracting the river where required, I propose to be the same as that " practised in the River Clyde, which, with the addition to the plan suggested by me " about eight or ten years ago, has proved so very successful, namely, by building jetties " from each shore, and moving the sand and gravel out of the intended channel by means " of dredges, and depositing it in the spaces between the jetties; and when the channel " was brought near to the depth it was expected the water would maintain, these jetties " have been joined by walls of rubble stone, whereby the channel has been preserved of " a regular depth. Without these junction walls this could not have been done, as the " water would have spread between the points of the jetties and thrown up sand-banks,

Mr. Webster.

24th January 1855.

" which would thus have rendered the channel full of shoals. By the line of jetties laid " down by me, the surface of the channel, supposing the tide to be confined within these " points, will be reduced to about 896 acres; namely, 448 acres less than it now is at high " water. Now the question is, how shall this deficiency of tide water, occasioned by the " contraction, be supplied? Towards the supply of this deficiency there are several sand- " banks in the channel of the river, which are now dry at three-quarters ebb, and there " are others which are nearly dry at half-ebb." Then he refers to the other sands. That, Sir, was the principle, namely, by half-tide training walls, which Mr. Rennie insisted upon as the proper mode of dealing with the channel, excepting under circumstances of peculiar interest, as the necessity of making docks under proper Parliamentary and other regulations which he justifies.

Then, Sir, there is a further paragraph: " In addition to this, I have to remark that the " river throughout, I mean the contracted channel, will be very much deepened, and " consequently the low water will be depressed in its surface." That, Sir, is a feature which all engineers insist upon. " And as the flood tide will be much less obstructed it " will flow farther up the Tyne and rise higher than it now does. And as it will receive " the tide-water in the first quarter of flood, and will retain this water until the last " quarter of ebb, it will produce a much greater effect in scouring the bar in proportion " to its quantity than it now does. And in addition to all these, it is proposed that the " height of the jetties shall little exceed the height of half-flood; so that a principal part " of the space embanked will still remain as a receptacle for tide-water. According to " this plan, therefore, the scouring effect of the tide will be materially increased, and " consequently the depth of water over the bar will be increased to the depth, I appre- " hend, of at least two feet."

He says upon this point, Sir, also at the beginning of his Report, " A solid embank- " ment on the side of the River must be avoided, or at least limited to a certain extent, " and other means devised to effect the object; but to both there is a limitation, and " therefore it becomes a nice point to settle with precision what depth can be obtained and " maintained in the River Tyne between its mouth and Newcastle Bridge, without con- " tracting it to a degree that may prove materially injurious to the navigation." But, Sir, you will observe that that sentence follows this—" So that in gaining depth of " water in the channel of the river, care must be taken that the depth on the bar be not " diminished." That, Sir, was the leading object which Mr. Rennie had, and which every engineer, and every nautical man who has really the interest of the Tyne and of the public at heart will insist upon, that the condition of the bar is the one feature to which attention must be directed.

Now, Sir, I was going to say that this matter of half-tide walls has been a good deal, I think, embrangled lately by the discussions which have taken place in this very river upon the question of full-tide walls. Sir, it may be expedient under proper regulations and restrictions, as in the case of the Hay Hole Docks, or of the Jarrow Dock, which was the subject of Parliamentary inquiry last Session, under the control of the Admiralty, or under proper restrictions as laid down by Act of Parliament, providing for the the interests of all parties according to the circumstances of the case, that full-tide walls should be adopted instead of half-tide walls. That has nothing to do with the principle of that which Mr. Rennie recommended, or with the principle for which the minority of the Commissioners have invariably contended. What they say is this: Viewing that river as it is, as a receptacle for tidal water, which by its ingress and outlet is to keep the entrance clear, (because upon that the Tyne must mainly depend,) dealing with the matter generally, abstract as little tidal water as possible; make your half-tide walls, which are sufficient for training purposes, and which answering that object by deepening the channel, will not be subject to the objection of abstracting the water. Now, Sir, I must say, that this embranglement is only a cloak for covering the land-making speculations which have been going on to this extent in the Tyne, and there is no ground which can ever justify the encroachments which have taken place, either upon the part of the Corporation in the upper portion of the river, or the recent encroachments of Messrs. Palmer, and Ellison, and Leslie, taking in that portion of convex shore in the way in which it has been done. If Parliament, having regard to all the circumstances of the case, making proper provisions for compensation in the nature of excavations, or in the nature of deepening the channel, see fit, or if the Admiralty see fit to approve of a full-tide wall, instead of a half-tide wall, that has nothing to do with the question of the general jurisdiction of the conservancy; but, except in the Tyne, it has never been heard of, that the process has been allowed to be pursued of which the minority of the Commissioners complain.

In that same Appendix, Sir, I told you that Captain Washington had inserted the Reports of different persons, and there are one or two passages with which I will just trouble you in passing, because I think it my duty to bring this case once for all fully before you. In Mr. Richardson's Report, who was a person of experience, at page 110, he refers to the difference between the question of half-tide and full-tide walls. He says, " The obvious disadvantage of this plan," (that is, the half-tide walls,) " is, that the land " enclosed would still remain unavailable for building or other purposes, whereas, if the " walls were built above flood height, the proprietors of the adjoining properties would, I " have no doubt, in most instances, if not in all, be willing to build the walls at their own " cost, were they permitted to have the land or quayage thus made." That, of course, Sir, goes to the question of what arrangements ought to be made between the Conserva-

Mr. Webster.

24th January 1855.

tors and the landowners in cases in which they are to be allowed to build full-tide walls. He says, in reference to Mr. Rennie's plan, "I do not see that I can improve upon the "line of walling laid down by Mr. Rennie, nor do I think it very material at what place "it is first begun, so long as it is built continuously, that is, without much time interven- "ing between the erection of one part of a wall and that of another part, especially where "the river is considerably contracted." That goes, Sir, to the point upon which I have already insisted, that these matters must be done as a whole, and not in detached portions, or without any plan, as is the way in which they have been already done.

Then, Sir, William Cubitt, at page 114, upon the same point says, "Without going at "all into a history of the past and present state of this river, or a long detail of causes "and effects, which influence and succeed each other in producing certain bend shoals, "channels, &c., all which have been ably commented upon by the late Mr. Rennie and "others, I shall take up at once the excellent survey of the river, as made by Mr. Giles "under Mr. Rennie's directions, and admit that the general line of the shores as laid "down upon that plan are for the most part good, and that the Committee are acting judi- "ciously in deciding to have them carried into effect, with such modifications as the peculiar "circumstances attending the trade of the River Tyne may appear to require." That, Sir, really opens up the whole question again, as to what it may be expedient to do under certain circumstances and under proper control, but it is at the same time a conclusive judgment against the mode of proceeding which has been adopted by the present Commissioners. And, Sir, in that letter of Mr. Armstrong, which I have already referred to, the same sentiments are put forth, ond I can only regret that a gentleman, who could express such proper and enlightened views twenty years ago, should have changed them to so bad a purpose after that date.

The next report, Sir, is the Report of Mr. Rendel, and I must call your attention to that in some little detail. Mr. Rendel was called in, as I have told you, at the end of 1848 or the beginning of 1849; it appears by his Report to have been at the end of 1848. He says, "Since the autumn of 1848, when I was first called on by the Corporation of "Newcastle to survey the River Tyne, and furnish a plan for the improvement of its "navigation, I have frequently had my attention directed to the subject. I have, "however, deferred till now coming to any conclusive opinion upon it, not only from "an anxious desire to weigh, with the greatest deliberation, my own conceptions, but "also that I might first make myself thoroughly acquainted with the great mass of evi- "dence that has in the meantime been given before Parliament, and otherwise, on all "the material points to be considered." He says, "Aware that it is your wish to have, "as briefly as is consistent with distinctness, the opinions at which I have arrived, I shall "at once proceed to report upon the various improvements in the river which I think "necessary and expedient, the nature and extent of the works required to ensure these "improvements, the order in which they should be executed, and their probable cost, "referring all who desire information as to the character of the inquiry I instituted before "forming my opinions to the accompanying Appendix." Now, Sir, I am told that that Appendix is a document of the greatest value, that it contains soundings and tidal sections, and diagrams, which, in the inquiry which you probably will think it your duty to take upon yourselves, will be of the greatest importance, and therefore I trust, Sir, you will request the Clerk of the Commissioners that that Appendix may, at all events, to-morrow, be placed upon your table.

(*Mr. Clayton.*) Of course every document which we have is at the command of this Commission.

(*Mr. Webster.*) "First, as to the various improvements which I consider necessary and "expedient. It will be apparent to you who have witnessed the development of the "railway system, that its tendency is to encroach on that important branch of the ship- "ping interest engaged in the coasting trade. Further, that the competition thus com- "menced is giving rise to a struggle amongst the several ports in your neighbourhood, "not only to meet the new and common rival, but also with each other for supremacy." Then he pursues that subject, which I do not follow, Sir.—"To increase the depth of water "on the bar, and improve the entrance channel from thence to the Narrows to the greatest "extent practicable, should be your first care." Sir, you will remember the condition which Mr. Rennie had laid down as the guiding condition of this inquiry, "For many years "past the depth at low-water spring tides has varied according to circumstances from "6 feet 6 inches to 8 feet. I have no doubt but that a minimum depth of 10 feet to "11 feet may be permanently maintained, and this increase I consider necessary, seeing "that the spring tides on this coast rise only from 13 feet to 16 feet, and neaps from "7 feet to 9 feet; that easterly winds bring a heavy sea on the bar, and that owing to the "crowds of vessels which occasionally arrive or depart on a favourable change of wind, it "is of the greatest importance to increase the length of tide time for passing the bar." Now, Sir, the question of the depth of water on the bar and the state of the bar as dis- closed by the earlier surveys was fully commented upon in Captain Washington's reports of 1849. I did not read the whole of it, as you can refer to it for your information, but you will find that it is quite clear that the state of the bar is not better, and there is very strong reason for coming to the conclusion that it is much worse than it was at some of those earlier times. But this question of the bar in reference to the Tyne, having regard to the character of the estuary, and the nature of the coast, and the nature of the trade, is rendered a vital and important question, because it is, as Mr. Rendel says, of the greatest importance to

increase the length of tide time for passing the bar. I believe, Sir, you can have evidence, if necessary, (it will appear upon returns which will be furnished to you, by the harbour-master, probably,) that sometimes almost as many as 200 vessels want to leave or come in at one tide.

Mr. Webster
24th January 1855.

(*Mr. Clayton.*) The number of 200 is quite within the compass; it is often as many as 300.

(*Mr. Webster.*) I am obliged to you. That gives a character to the Tyne, and to this inquiry, and an importance to the condition which Mr. Rendel assigns of increasing the time of tide for passing the bar, far beyond any other consideration which could be entered into.

Mr. Rendel then proceeds to the question of piers, which I do not now go into, Sir, because it has been a matter of separate inquiry, although I shall have to make a remark upon it hereafter. The first improvement in order was with reference to the bar:—"The "next improvement in order is the removal of Whitehill Point. There is no obstruction "in the whole river which I regard as more injurious to its tidal economy than this point. "It forms the apex of the first great bend within the harbour's mouth; it suddenly con-"tracts the width of the river from 1,400 feet to less than half that breadth; it directly "produces the banks known as the Dortwick Sands and Whitehill Sands; and from its "being just on the flood-stream side of Jarrow Slake, it throws the current over the "Slake, and thus powerfully, though indirectly, aids the formation of that very objection-"able shoal or river bar known as Jarrow Sand. Whitehill Point must therefore be "removed; and as a part of the same improvement, a portion of Hayhole Point must be "cut off, and the river below half-tide level must be confined in a straight course by "proper banks to Howdon on the north shore, and Jarrow Point on the south. By these "means I have no doubt but that you would be able to maintain a good navigable "channel up to Howdon, having a minimum fairway depth of from 7 to 9 feet at low-"water spring tides, with the full time and sea range of tide. Besides these advantages, "I consider the importance of Hayhole as a shipping place should be further improved by "the adjunct works to be hereafter explained." The question of Hayhole, Sir, has been the subject of Parliamentary inquiry, with reference to the Northumberland Docks; therefore that is not a matter upon which I now propose to make any observations, excepting this passing one—that where there are docks under proper regulations, and the return of water that comes from them, it is, as regards the question of river economy, quite a distinct question from where you have the river replaced by solid land, which never can return anything, because by docks you will have probably as much out of them as by the half-tide training walls which Mr. Rennie and Mr. Rendel insisted upon:—"Between Howdon and "Bill Point the requisite improvements must be effected by 'training' the river; that is, "by confining its stream within a limited width, and in a direction that will insure the "greatest uniformity of current for the ebb tide and land waters, as well as for the flood-"stream, thereby not only increasing the duration and column of the latter in the higher "reaches of the river, but also the power of the backwater, fresh and salt, to maintain an "efficient scour, and good navigable channel. Whether this training should be done by "groynes run off from each shore, or by guiding banks formed parallel to the channel: "what should be the height of such groynes or banks, so as to insure the best results for "the navigation as a highway with the least interference with existing quays and shipping "places on both shores of the river, are questions that will be properly considered under "the head of 'Proposed Works.' I shall, therefore, only remark in this part of my Report, "that I consider it essentially necessary that the fairway channel should be improved to an "extent that would give a slope to the low-water surface of the river of not more than "2 inches per mile in any part between Howdon and Bill Point, thus increasing the tidal "column at the latter place to 14 feet 9 inches at spring tides, or 2 feet 9 inches more "than at present, and proportionably accelerating the time of young flood."

Then, Sir, Mr. Rendel refers to the tidal diagrams in the Appendix, which will of course show the reasons for the conclusion to which he there comes:—"At Bill Point I consider "more improvement will be effected by blasting the rocks below low water." You probably had your attention directed yesterday to the state of things at Bill Point, and the very curious works going on there, upon which I shall have a word to say. "At "Bill Point I consider more improvement will be effected by blasting the rocks below "low water, to the extent to which they have already been removed at high water, than "by any further removal of the point between low and high water. The excavation at "this point, the removal of a small portion of the almost opposite projection near Ewehole, "of another small portion of the same shore at the Brandling Main Staiths, and of a larger "portion at Friar's Goose Point, joined with a proper training of the river between these "places, and up to Newcastle Bridge, will, I have no doubt, with some dredging" (observe the way in which he speaks of dredging,) "effect an improvement that will reduce the "slope of the low-water surface to a maximum of $2\frac{1}{2}$ inches per mile for the whole distance "between Bill Point and the town quay. This would give a tidal column at Newcastle "Bridge of 14 feet 6 inches, or from 2 feet 6 inches to 3 feet more than at present, and "hasten the time of young flood about an hour. Assuming the training of the stream to "be effectual, and the works generally of the kind I shall propose under the next head, I "do not doubt but that the fairway channel will be maintained, so as to give a minimum "depth at low water of from 6 to 7 feet, and that such depth will extend to a good "navigable width."

Mr. Webster.

24th January 1855.

Then, Sir, he goes to the upper part of the river, upon which I do not propose to occupy your time. "Secondly.—The nature and extent of the works required to insure these "improvements. By a reference to the plan No. 1, of the works designed, which accom- "panies this Report, it will be seen that I propose to improve the entrance to the harbour "by the construction of a pier over the Herd Sand, of another on the Tynemouth Rocks, "and of two more at the Narrows, running east, the one from the Low Lights." Then he describes those:—"These objects are to aid the outer piers in giving a proper direction "to the stream of flood and ebb between Shields Harbour and the bar, thereby scouring "the middle ground and part of the Insand, and in effectually stopping the passage to the "river of any sea or sand that might enter through the openings in the outer piers, or "otherwise. In Shields Harbour no works are required, but I have shown on the plan, "lines up to which the two quays may be built by the owners of the adjoining property. "I would add, that as the present quays require to be rebuilt, they should be regulated by "these lines, and the whole constructed in a permanent manner."

Now, Sir, just observe what is the consequence of the course which the Commissioners have thought fit to adopt. Not having settled any lines, leaving the matter in all this state of uncertainty, in which it has existed as a direct premium on the interest of Newcastle as against the interest of Shields, because those parties who are interested in property at this end of the river, if they happen to have friends at court who concur in the views of Mr. Brooks, have no difficulty in getting lines laid down and works executed; but until you have some complete system of river lines, conclusively laid down under an authority quite independent of local interests, what a disadvantageous position you have the people of Shields in as regards the people of Newcastle. Mr. Rendel then proceeds to say,—"I "have stated in the first head of this Report the importance I attach to the removal of "Whitehill Point and the works on both sides of the river from thence to Howdon. In "the accomplishment of these objects, the division of the deep-water channel of the river "from the numerous and important coal staiths on the Hayhole shore, presents the greatest "difficulty." Then he goes to the question of the docks, all which has now been disposed of by Parliament. "After due consideration of all the questions involved, I have decided "that the breadth should be 1,000 feet at Whitehill Point, diminishing upwards in the "ratio of the decrease in the tidal water to be passed, so as to obtain, as far as practicable, an "uniform current during the first half of the ebb, at the same time affording the requisite "space for the convenient working of shipping. In considering the kind of works best "suited for the training of the river above Howdon, it was necessary to determine the "relative advantages of groynes and parallel banks; also what should be their height with "reference to low water. On going carefully into the requisite question of back water "to scour and maintain the proper depth of water at the bar and the lower reaches of the "river, it becomes apparent that the works which would least interfere with the capacity "of the river as a tidal receptacle should be adopted, and that as far as Bill Point all the "training should be effected by half-tide banks. It also appeared that such banks, made "with openings at suitable intervals, would form a less obstruction to the adjoining shore "than groynes." Then he refers to certain cases of obstruction, into which it is not necessary to go. Of course, the details of these half-tide banks was a matter entirely subordinate to the general principle which he lays down, namely, a principle in conformity with the recommendation of the Tidal Harbour Commissioners' Report, that there should be no abstraction of tidal water, except that absolutely necessary, and that all banks, excepting under special circumstances, should not be higher than half-tide banks.

Then, Sir, he goes into further details of works, which I do not mean to trouble you with, excepting as showing the extreme care taken by Mr. Rendel to treat this river as a comprehensive whole, and that without any detraction from the merits of the plan, alterations might be made in its execution. He then proceeds to "the order in which the "works should be executed;" and this I do press as a matter which the Commissioners have departed from without any reason or any consideration, and which is a matter of the most serious character. "The whole of the works between the bar and Bill Point are so "necessary to any very considerable improvement in the navigation that they should be "regarded as the first section to be executed. All the works comprised in it should be "begun at such times that they might be completed simultaneously in four or five years "from the commencement of operations. To accomplish this, the first work set in hand "should be the south pier. When this is sufficiently advanced the north pier should be "commenced. As soon as it is raised above the level of high water, the two remaining "piers at the Narrows, and the works between Whitehill and Bill Points should be pressed "forward, so as to be ready by the time the north and south piers are finished. Until "the entrance piers, the training banks, the removal of Whitehill, Hayhole, and Bill "Points, and the other shore works are completed, it would not be prudent to undertake "any dredging beyond what might be necessary for incidental purposes." Now, Sir, I say that no person of any experience in a river of this character, regarding the peculiar character of the soil which this is, and who was sufficiently independent of local interests to advise what was for the best, could take the least exception to this general course of policy which Mr. Rendel here lays down. It is wholly foreign to any question as to the precise condition of the river, or other similar matter of detail. He says, construct your piers and training banks, anp remove those points before you attempt to deal with the channel by dredging, because it is only throwing away money. Having settled the proper section at different points, with reference to the trade and the accommodation to be afforded

Mr. Webster.

24th January 1855.

and the water to be passed, the water will then adapt the channel to its requirements, and all the farther improvements which are shown to be necessary may be done by having recourse to the expensive operation of dredging. Therefore, the course of operation which the Commissioners have thought fit to pursue is exactly the reverse of that which Mr. Rendel recommends, and entirely contrary to the course of policy which every engineer, from Mr. Rennie downwards, who has taken up this matter as a whole, without reference to local and individual interests, has recommended. That is a Report which, I am afraid, has been kept in the strong box, like Mr. Rennie's, and I am not aware of its ever having been made any great use of.

(*Mr. Clayton.*) It is printed. That does not show any design to keep it back.

(*Mr. Webster.*) I am obliged to my excellent friend the Clerk to the Commissioners for reminding me that a motion was made that 200 copies might be printed for the use of the public, which was refused by the majority of the Commissioners. That is not very material, Sir; but this, Sir, is most material,—that this Report of Mr. Rendel followed substantially the same fate as the Report of Mr. Rennie. It answered the purpose for which it was procured. Instructions were given to Mr. Rendel in the autumn of 1848, and he was called as a witness to defeat the Tyne Conservancy Bill of 1849, if possible; but the House of Commons passed it, and it only was not passed into a law by the Lords because of the early termination of the session, when it was useless to throw away more money. But the Corporation finding it necessary to set their house in order, themselves admitted the facts upon which the Shields parties had come to Parliament; they came with a Bill,—they no longer wanted Mr. Rendel,—they were glad to transfer his Report and him, and to make the Conservancy Commissioners pay for it. Whether he was too independent a man, or his scheme was too complete a scheme for public interests, as compared with private interests, to admit of the majority of the new Commissioners, who were local parties and not interested for the public, employing that gentleman or not is immaterial, but they did not employ him to carry out his scheme of treating the river as a whole.

The majority of the Commissioners have had repeated warnings of the objections to be taken to this burking, so to speak, of a comprehensive system of dealing with the Tyne. The funds were ample—there is no pretence of want of funds. Shipowners, as the piers showed, and coalowners, as the Hayhole docks showed, were ready to submit to any reasonable amount of taxation, if they could only get the required accommodation.

Another Report, which you probably have, but which you must have your attention called to if you have it not, is a letter of Mr. Calver, of January 1852, addressed to the Tyne Improvement Commissioners. That gentleman had been examined in Parliament, producing these sections which have been referred to, tidal diagrams, and also transverse sections, showing the capacity of the river at different points, taken by order of the Admiralty, for the purpose of enabling the state of the river a different points to be ascertained exactly, and what would be the proper capacity to give to it. I believe some attempt was made in Parliament, if my memory serves me aright, to impugn the accuracy of those sections. I believe it utterly failed; and I am not aware, except some controversy which took place between himself and Mr. Brooks, that the attempt was ever made again. I shall not gy into, and certainly do not presume that you will go into, any very great detail as regards these, what I call rather homœopathic questions, as to the precise amount of water here and there, when you have so many much larger questions to deal with. But, Sir, Mr. Calver having been called upon, some questions arose between him and Mr. Brooks, and, in order to justify himself, he addressed a letter to the Tyne Improvement Commissioners, in which he reviews Mr. Brooks's statements, and Mr. Thomas John Taylor's statement, and a part of Mr. Rendel's Report, and refers to a paper by Mr. David Stephenson, who is a considerable authority on the matter of the improvement of tidal rivers, having carried out very successful improvements in the Ribble and in other rivers, and is a gentleman, I believe, who has been very extensively employed by the Admiralty on questions of this kind. I shall only trouble you with the conclusions to which Mr. Calver has come, as indicating the true principles upon which you, if I may be allowed to say so, will probably direct that the Tyne shall be dealt with. He says this:—"First, that owing to the "comparatively contracted country from which the drainages of our rivers derive their "supplies, it is chiefly from the increased duration of tidal influence that we must expect "improvement in tide navigation, the regulation of the fresh-water stream being an "operation of secondary importance, but not on that account to be overlooked." You will remember, Sir, that that is perfectly consistent with the principle which Mr. Rendel had laid down as to the importance of lengthening the time of passing the bar. "Second, "that the whole tidal phenomena of the navigation to be improved ought to be ascertained, "in order that the engineer may be enabled to discover in what part of the river the most "prejudicial retardations of the tidal wave and obstructions of the current take place." That has been done by Mr. Rendel (as I presume) in the elaborate details which are contained in the Appendix to his Report. "Third, that in tracing these retardations to the "proper cause, and suggesting means for their removal, works should be adopted which "do not injuriously abstract tidal water from the sea channels. Fourth, that the works "best suited for attaining the desired end, consist chiefly in lowering the bed of the "river, and removing all natural and artificial obstructions, and in erecting low rubble "walls for the direction of the currents." He is following out the principle which Mr. Rennie, and all other engineers, have advocated as the mode of dealing with the river in its natural state,—that is, where you do not require to have extensive commercial

Mr. Webster.

24th January 1855.

arrangements like docks on its sides. "Fifth, that although general views of the nature "of these operations may be given, the precise details of such works as shall be best suited "to particular localities can, in the present state of our information, be determined only "by engineering experience. And lastly, that, by the execution of works designed in "accordance with these general views, very beneficial results have been and may be "produced for a comparatively small expenditure." Now, Sir, I refer only to that as the production of a gentleman of considerable experience, confirmatory of the consistent testimony of all the engineers who ever dealt with this question, and condemnatory of the course which the majority of the Commissioners have thought fit to follow; because, Sir, I do not mean for a moment to say that Mr. Brooks has been altogether a free agent in this matter. I do not believe that he has. I believe that engineers differ very materially from the views which Mr. Brooks takes about the question of full-tide jetties as against half-tide walls, where the only object is to train the channel, and to do the best you can for the outlet of the river at the bar. But what I say is this: that it has not been convenient to retain the services of gentlemen of Mr. Rendel's independence, or to submit to the Admiralty in these matters, or to an independent tribunal, because there were other interests to be consulted, which could not have been served by such submission.

Since that Report of Mr. Rendel, the question of the piers has undergone further consideration; and as connected with that there is a curious history illustrative of the way in which the river has been dealt with, and the Commission has been dealt with under the existing constitution. The Act of 1852, which provided for the Hayhole docks, also provided funds for the erection of these piers by an additional tax upon the shipowners, and from which tax, as I understand, there are ample funds, I believe as much as nearly amounts to 12,000*l.* a-year, in the hands of the treasurer of the Commissioners for this special purpose. Although the Act was passed in 1852, very little progress has been made in that matter. Something has been done, but I am told very little; perhaps my learned friend Mr. Seymour, who appears for the majority of the Commissioners, will inform us how much. However, Sir, it is essential for me to call your attention to one of the small incidents connected with those piers, and what has been done. Mr. Walker was consulted upon them, who I believe had not been previously consulted upon the matter, excepting by the Corporation of Newcastle many years ago. He had been inquiring officer upon this very Bill, I believe.

(*Mr. Clayton.*) He had been consulted by the Corporation.

(*Mr. Webster.*) Mr. Clayton, who goes to the best quarter he can for advice at the time, went to Mr. Walker many years ago, and to Mr. Rendel in 1849–50; but Mr. Walker had not been directly mixed up with these Tyne questions; he had been a referee for the Admiralty upon one of the Bills.

(*Mr. Clayton.*) Upon the Bill of 1852.

(*Mr. Webster.*) I thought I was right. There is a Report which I passed over in the order of date, which I merely will mention, of Messrs. Lawes and Abernethy, upon the Shields Bill of 1850, and upon the Tyne Improvement Bill introduced by the Corporation, which became the Tyne Act. Mr. Walker had been the inquiring officer with reference to the Bill of 1852, which resulted in the Hayhole docks, and in the powers for raising the piers. This Report is dated the 15th of November 1853. He says, "A difference of "opinion having been found to exist between the Admiralty and the Tyne Improvement "Commissioners, or perhaps I should say, between the professional advisers of the two "bodies and others, as to the plan within the limits of deviation proper to be adopted, a "letter from Mr. Clayton, the officer of the Tyne Improvement Commissioners, of the "18th of April last, addressed to the Secretary of the Admiralty, suggests that if their Lord-"ships would approve of the plan being submitted to Mr. Walker, there would be a pro-"bability that the Commissioners would feel themselves justified in acquiescing in any "alteration in the plan he might decide upon." Now, Sir, I am told that this communication of Mr. Clayton's was a matter wholly without the authority of the Commissioners; and if it be so, it is a very curious incident, illustrative of some other circumstances that may explain something in this matter. I am sure Mr. Clayton will know that I do not mean to make any imputation upon him, because he is a gentleman of the highest character, and a most skilful professional man for the interests of his clients; and having so many, the Corporation of Newcastle and these gentlemen on the foreshore, and the Tyne Commissioners, he may have very different interests to serve; but the fact is, that some communication takes place between Mr. Clayton and Mr. Walker, who had been a professional adviser of the old Corporation, and it appears that Mr. Clayton thinks that Mr. Walker's views would be more acceptable than Mr. Rendel's, or probably than anybody else's, and so the matter becomes referred to Mr. Walker. To that I make no objection at all, only it is rather a singular illustration, added to the way in which the Tyne has been dealt with. As I say, Sir, scarcely anything has been done upon it; there is plenty of money; but instead of appointing a resident engineer under Mr. Walker, there has been an attempt made by the majority of the Commissioners to place the piers also under the control of Mr. Brooks, who was so much occupied that he could not even give the minority of the Commissioners the tidal areas abstracted. That is again a matter in the conduct of this Commission which has been most detrimental to the interests of the public, and most disappointing to the shipowners, who certainly looked to these piers, pointed out by Mr. Rendel, as one of the operations to be commenced at once, and for which they had provided ample funds; it is most disappointing to them that that should be the state of things.

Mr. Webster.

24th January 1855.

I now come, Sir, to the state of things and the circumstances which led more immediately to the appointment of this commission. The minority, from almost their first meeting to the present, have insisted, and now insist, that what has been going on both as regards encroachments and management, has been but a perpetuation of the old practices which it was the express intention of the Act of 1850 to cure, but which has signally failed; and the letter of the 3d of June, which has been commented upon, and to which a reply has been attempted on behalf of the majority, was addressed to Sir James Graham, and a more legitimate, constitutional course could not possibly be adopted. If the management of this great navigable highway, of the greatest importance in the kingdom, is in the hands of local interests, who will not do what they ought to do, from circumstances not perhaps under their control, where must you look but to the Admiralty, or to an independent commission, such as that before which we have now the honour of appearing, for the redress of grievances? Therefore, they applied to the Admiralty, and in the letter of the 14th of August Mr. Osborne says, "I am commanded by the Lords Commissioners of the Admiralty to acknowledge the receipt of your letter of the 20th of July, addressed to Sir James Graham" (that is, the answer of the majority to the letter of the minority), "to which I am directed to reply, that their Lordships fully recognize the right of those Commissioners to address the Admiralty, if they consider it necessary to do so; but their Lordships decline entering into any controversy with you on the several statements that you have thought proper to make, being satisfied that the commission which is about to be appointed by Her Majesty will ascertain the truth, and will determine on the right course to be pursued." Therefore, Sir, you have that bill of indictment, so to speak, which Mr. Clayton was pleased to ask for yesterday, of the 3d of June, and the subsequent attempted answer to it as matters to be submitted to you, and to which I now proceed. In the commencement, the letter of the 3d of June states, that the undersigned Commissioners, six in number, "bring under the notice of the Lords of the Admiralty the following circumstances connected with the management of this most important navigation; we would remind you of the Act of 1850, by which the conservancy of the river was transferred from the Corporation of Newcastle to a mixed commission representing that Corporation and those of Gateshead, South Shields, and Tynemouth (North Shields), with four life Commissioners named in the Act, 18 in all. By the Act, it was also provided that the present Town Clerk and Treasurer of the Corporation of Newcastle should be respectively the Clerk and Treasurer to the Commissioners." That, Sir, was a condition which the Shields gentlemen were obliged to submit to; they had no alternative—they had no choice in the matter, but losing that for which they had struggled so hard. "The neglect and mismanagement of the river previous to 1850, which induced the Lords of the Admiralty to support the abolition of the exclusive conservancy of Newcastle, are referred to in the following extract from the Report of Messrs. Abernethy and Lawes, Admiralty Inspectors." They were the gentlemen to whom the Bill was referred. "The principal features of the plan proposed by the late Mr. Rennie in 1813, appear to us to have been judicious, and that they must in the main govern any future works for the effectual improvement of the river; he proposed to make such alterations in the navigable channel of the river as would tend to equalize its sectional area, and thereby the velocity of the current, and to add to the volume of tidal water, by providing additional depth of channel wherever its sectional area would be lessened by any contraction in its breadth. That plan, however, according to the evidence which has been adduced before us, does not appear to have been acted upon; and we think that the works which have been executed from time to time have been based upon erroneous principles. The existing channel is still irregular and tortuous, whilst its capacity has been lessened by embanking to a considerable extent, without an equivalent being provided for the reduction of the sectional area." They then, Sir, refer to the statement which I have already read about Mr. Calver's calculations, and they say, "These are startling results, especially when taken in connexion with the fact that the depth in the navigable channel generally has not been increased, and that the entrance to the river is mainly dependent upon the volume of water passing over the bar."

Then the letter of the minority goes on to state,—"It might have been expected that the new Conservators, when they entered upon their office, would have commenced to repair the mismanagement and avoid the example of their predecessors. But the Commissioners have persisted in the very same pernicious system of engineering. Up to the change in the conservancy, the tidal area of the Tyne had been diminished to the extent of ninety-five acres, by encroachments unnecessary and injurious to the river, as is becoming every day more apparent, and carried out upon no uniform line,—encroachments, however, of immense value to the owners of the adjoining river side estates. This diminution of tidal water is a reduction of the scouring power which maintains Shields Harbour and the navigable depth over the bar. The bar is the key to the whole navigation, and its good condition is of public and national importance. By the encroachments of which we complain, a daily increasing injury is being done which cannot be repaired. The ground abstracted from the sides of the river forms valuable sites for manufactories, and is readily let at high rents on long leases by the Corporation of Newcastle, in front of whose estates the encroachments have been principally made; and when once the land has been covered with valuable erections, its restoration to its former state is hopeless. The Commissioners connected with Newcastle and Gateshead have a majority of votes in the Board over those connected with Shields; the two first-mentioned towns form practically one interest, and their influence in the commission has been used

Mr. Webster.

24th January 1855.

" to perpetuate and extend the system of engineering referred to. On many occasions we " have brought forward the continued mismanagement of the river, by motions directed to " the abandoment of the unsound and ruinous system of engineering which has been " practised. We have opposed the alienation of the foreshore of the river, which we " consider to be the freehold of the public, to the adjoining proprietors, corporate or " individual, but we have uniformly been outvoted by the Newcastle Commissioners, some- " times by the narrowest majority." You will remember the instance of the casting-vote being given by the Chairman. " We cannot tell in precise figures how much the Tyne " has been encroached upon during the three years and a half that the Commission has " been in operation. A return moved for by Captain Purdo, R.N., to show this, was " refused by the majority of the Board, avowedly from a dread lest the information should " reach the Lords of the Admiralty." I do not know, Sir, whether Mr. Rayne was under the terror of the Admiralty or not, but, however, you will remember that Mr. Rayne disposed of Captain Purdo's motion by the opinion that it would be dangerous to give the information—the danger now appears to be the Lords of the Admiralty.—" Nor can we tell " the precise extent to which the navigable depth of the Tyne has deteriorated. But we " know "—now those are gentlemen residing at Shields, and shipowners—" but we know " that the main channel of Shields Harbour is worse, and that the Commissioners are " constantly importuned to send the dredger to shipping places on both sides the river, " which are gradually and rapidly shoaling."

Now, Sir, to dwell for one moment upon that. The trade in Shields Harbour has not decreased materially—it has probably increased. There are as many as seven ships, I believe, at the present moment in the tiers as placed by the Harbour-master, I suppose by direction of the majority of the Commissioners, where there ought only to be five. But, Sir, it is those ships and that trade which in proportion as they increase would rather tend to deepen the harbour of Shields. Those very ships are the best practical engineers in deepening that river, and if taken away the harbour would probably grow up within a very short time. Therefore, if the fact be, that notwithstanding the increase of trade, the condition of Shields Harbour is worse, is not it at once referable to the encroachments which have taken place in the upper part of the river, for to what other cause can it be referred?

The letter then proceeds,—" We are confident that, although Mr. Calver's survey of " 1849 showed a great deterioration in the river as compared with 1813, the full effects of " the encroachments had not then appeared, and that a re-survey of the river now would " show a very rapid deterioration in the past five years. In short, the system followed by " the Corporation at first, and by the Commission since, has been to reduce the size of the " Tyne without increasing its depth, to endanger Shields Harbour and the bar, and to " increase the estates of the adjoining landowners at the cost of the public freehold of the " Tyne. The dredging operations (which cost three times as much as at Sunderland, " because, instead of sending the dredged material to sea, the Commissioners have insisted " on using it in making land for the Corporation and others,) are carried on, not to " form new progressive improvements, but are mere partial and irregular attempts to remedy " the effects of previous unsound and unskilful engineering. Although the majority of the " Commissioners have rejected every motion for the adoption of a sound and consistent " principle of engineering, they have met these motions by a simple negative, and have " never laid down for themselves any progressive and foreseeing line of river operations, " isolated cases only being taken up as they accidentally arise." That, Sir, is a continuance of the same charges which were made in the Session of 1849. " Meanwhile the " ballast dredged from the bed of the Thames is deposited in the bed of the Tyne, the full- " tide cross jetties are allowing a gradual elevation of the sides of the river; the materials " raised by the spasmodic dredging operations at various places where new shoals have " grown up, are deposited also below high-water mark. The process of encroachment by " these means is in rapid progress, and we calculate that, with the enormous encroachment " upon Jarrow Slake, contemplated by the York, Newcastle, and Berwick Railway Com- " pany, the River Tyne will be found reduced within a few years to three-fourths of its " original area. So great a reduction must inevitably injure the berthage of ships in " Shields Harbour as well as the bar. The only possible remedy now available is the " immediate abolition of the present system of cross jetties and full-tide embankments; " the vigorous enforcement of the principle that every new embankment, whether for " docks or otherwise, should be compensated for directly by a proportionate amount of " excavation to be made and maintained as a receptacle for the excluded tidal water; the " immediate discontinuance of the deposit of ballast or dredged materials within any part " of the tidal flow; and lastly, the execution of a carefully designed, comprehensive system " of works for training the river, founded on the principle of encouraging the tidal flow, " and increasing the tidal capacity of the river. Such a system was laid down by Mr. " Rennie in 1816, and should now be carried out under the responsibility of some eminent " engineer, who would possess the confidence of the Lords of the Admiralty and of the " public. As an illustration of the still existing conflict of Newcastle interests with the " river, we would refer to the proceedings of the last monthly meeting of the board, where " a motion brought forward by us for the immediate abandonment of the present practice " of systematically excluding tidal water by embankments on the foreshore, was defeated " by the casting vote of the Mayor of Newcastle, who occupied the chair, and at the same " meeting the clerk to the Commissioners, in his capacity of town clerk of Newcastle,

Mr. Webster.

24th January 1855.

" informed the Commissioners that the Corporation claimed the ownership of all the fore-
" shores of the Tyne, and would therefore refuse to render any account of the monies
" received still by the Corporation, as annual, acknowledgments for licences of jetties and
" other projections into the tideway, which the Commissioners had demanded, considering
" themselves entitled to these acknowledgments as the present conservators of the river.
" And there are numerous other instances in which the interests of the river and those of
" Newcastle are at variance, while both the Corporation and the Commissioners have the
" same confidential legal adviser."

Now, Sir, I think that what I have read to you to-day of the proceedings of the Commissioners fully justifies every allegation contained in this paper (I will go to the attempted reply immediately); and, Sir, you shall have it proved, by having presented before you every one of the gentlemen who have taken a part in this matter, and disproved, if possible, by my learned friend on cross-examination. Sir, there is one matter which does not appear upon those Minutes, which I will advert to as illustrative of the position in which the shipowners and the minority of the Commissioners find themselves in matters of this sort. A question arose as to what the Commissioners should pay the Corporation of Newcastle, for under their powers of transfer. The Corporation, as I am informed, set up a claim to the dredging machines and to be paid for them. The clerk of the Commissioners, in his character of clerk of the Commissioners, was instructed to obtain the opinion of counsel, and that gentleman, in his character of town clerk of the Corporation of Newcastle, was placed in this delicate position, of the Corporation being in direct antagonism with the Conservancy upon a matter of purchase and sale, and of his having to prepare a case for the opinion of counsel upon this matter. How could any gentleman, even of superior attainments to those of Mr. Clayton, discharge that duty properly? The result, as I am informed, was, that the case was submitted to a gentleman of the bar, Mr. Cowling, than whom a greater authority does not exist, if the case had been stated as it should have been stated, in one way on behalf of the independent interests of Shields, and in another way on behalf of the authorities of Newcastle. I believe the conclusion was, that the Conservancy were to pay the Corporation for these old dredging machines, which had been purchased by river funds. That is one of the circumstances which show the conflict of interests existing under the present state of things.

Then, Sir, they go on to say, " If the Tyne were now suffering merely from neglect, by the
" useless expenditure of its fund, or by waste of time in commencing active operations for
" its improvement, it would even in that case be a matter deserving the attention of the
" Lords of the Admiralty; but when the most important river and harbour on the north-
" east coast is not merely suffering from neglect, but is daily undergoing serious deterioration
" in its navigable and tidal capacity, and when an unsound system is being persisted in,
" the ruinous results of which we feel will more distinctly than ever yet appear, we must
" bring before their Lordships the urgency of the case. As a most important practical
" step, we would respectfully press upon them the necessity of their ordering a fresh survey
" of the Tyne, or of such portions of it as are alleged to have become worse, to be made
" forthwith, in order that the further results of the past five years may be clearly exhibited
" and made manifest beyond dispute."

Now, Sir, I was amused by Mr. Clayton yesterday saying, with that gravity which he can assume, that he really did not know what was to be the bill of indictment preferred against the majority of the Commissioners before you. I should have thought, Sir, that any gentleman would have understood that as a very clear bill of indictment, and certainly the majority of the Commissioners so understood it. How did they attempt to deal with it, Sir? They prepared an answer, which was adopted at a meeting of the Commissioners on the 20th or 21st of July. Mr. Rayne, who was the gentleman so much alarmed at the information which was to get out by furnishing the quantities of land abstracted, appears to have made a very eloquent speech, and to have taken a very active part in reference to what he called the "abusive" proceedings (strong language, I must say,) of these six gentlemen, and which was replied to by Captain Purdo and others. But, Sir, this is the answer of the majority of the Commissioners. " A letter addressed to you, as First Lord of
" the Admiralty, by six of the eighteen Tyne Improvement Commissioners, dated the 3d of
" June last, moved for in the House of Commons on the 20th of the same month by
" Mr. Lindsay, the member for Tynemouth, and printed amongst the proceedings of the
" House, has been this day taken into consideration at a meeting of the body of Commis-
" sioners, in whose name I have now the honour to address you. On the propriety of the
" course these gentlemen have taken I shall not make any comment, but proceed to refute
" the allegations and assumptions, wholly unwarranted by facts, which they have circulated.
" It will be necessary that I should at the same time advert to a report of Mr. Edward
" Killwick Calver,"—that is the one which I read to you, Sir,—" (a surveyor in the employ-
" ment of the Admiralty,) which report, on the motion of the same Mr. Lindsay, was ordered
" by the House of Commons to be printed on the 16th day of the same month of June." This is beautifully drawn. I can recognize the language of my learned friend, the Town Clerk, and it was probably settled by the Recorder; that is the history of this letter. " The Com-
" mission to which the Legislature has confided the conservancy of the River Tyne is formed
" on the representative system. The Corporation of Newcastle returns six of its members;
" the Corporation of Tynemouth (North Shields), three; the Corporation of South Shields,
" three; the Corporation of Gateshead, two; and four Commissioners are named in the
" Act, making eighteen in the whole. The Act of 1850, by which the conservancy was

Mr. Webster.
24th January 1855.

" established on its present footing, was the result of a compromise with the Corporation " of Newcastle, the former conservators." Now, Sir, that is not the fact as regards the constitution of the Commission; it is the fact as regards this, that the people of Shields, having been exhausted by a most expensive Parliamentary contest in the preceding Session which had been fruitless by reason of the termination of the Session, were too glad to take the best they could, but they never consented to such a constitution of the Commission, knowing full well and protesting before the Committee, who were anxious, of course, to do what they thought best, and did what they thought best, that what has now taken place would be the result of such a Commission without independent Admiralty or other control. Therefore, Sir, this allegation, coupled in that way, that "the Act of 1850, by which the " conservancy was established on its present footing, was the result of a compromise," so far as regards that which is a most serious grievance, is not true

(*Mr. Clayton.*) If you look at the Act, you will find that its preamble states that it is a compromise, and the question of the constituent parts of the Commission was referred to a Committee of the House of Commons.

(*Mr. Webster.*) True, Sir, it was; but, Sir, does my learned friend Mr. Clayton mean seriously to insist, or to instruct the learned Recorder to insist, that because an Act of Parliament contains recitals drawn by the Town Clerk of Newcastle, and forced upon the people of Shields as the best terms they can get, those recitals in the Act of Parliament are anything more than evidence of this, that they had a most astute man at the helm, who endeavoured to get the best terms and put the best face upon it as a Parliamentary title? And, Sir, what he now says, that it was left to the Committee about the constitution of the Commission, is very far short of the truth—my assertion is, that the gentlemen of Shields, exhausted as they were, and compelled to submit to these terms, said, No, we will have no compromise about your Commission, because the one that you want, and the one that you will get, is one which will never be of any use to us.

" The main object of the letter of the 3d of June, addressed to you by six of the Com- " missioners, as it will hereafter appear, was to obstruct the progress of a Bill for the " formation of a dock on Jarrow Slake, (a bay on the south side of the Tyne, and within " the borough of South Shields), a work which must contribute much to advance the " interests of that borough, and must greatly benefit the general commerce of the Tyne, " by affording a convenient place of shipment for large quantities of coal now shipped at " Sunderland and other inferior ports." Now, Sir, I deny, on behalf of those six gentlemen, that that was the object of their letter. Those six gentlemen in that letter refer to that as an additional abstraction, but that was a matter submitted to Parliament in a Bill upon which the Admiralty were heard by counsel before a Committee of Parliament, and which was adjudicated upon under the special circumstances of the case. What the Admiralty contended for, but upon which they were defeated, the matter having been allowed to pass the House of Commons, the opposition not having taken place till the Bill came to the House of Lords,—what the Admiralty contended for, and what those gentlemen, as I am informed they will tell you, contended for, was this,—that it was a serious encroachment, and that following up their principle of allowing no abstraction of tidal space to diminish the volume of tidal water, that was a matter which was a serious objection to the Bill, but that at all events it was a matter as regards which the Bill should not be allowed to pass without proper consideration. I deny, Sir, that that was, as alleged in this letter, the main object of the letter of the 3d of June; and in fact, Sir, in the letter which I read to you in extenso, you will see in how very incidental a manner it is introduced, merely as carrying out the general principle of preventing encroachment on the tidal area.

" The six gentlemen signing the letter to you are Captain William Purdo, a resident at " Sunderland,"—therefore independent of Newcastle, I presume,—" Mr. James Cochrane " Stevenson, a manufacturer, occupying with his manufactory or its appendages a portion " of Jarrow Slake, being two of the Commissioners appointed by the Act of 1850; the " three Commissioners elected by North Shields, and one of the Commissioners elected by " South Shields. We impute no motives, but we cannot conceal from ourselves or from " you, that such is the position of the several parties signing this letter." Why, Sir, the Act of Parliament would have shown that, and therefore it was not very material that this delicate insinuation should have appeared in this answer. " These gentlemen tell you that " 'up to the change in the Conservancy, the tidal area of the Tyne had been diminished " 'to the extent of 95 acres;' they omit, however, to say that the advice of the late Mr. " Rennie was, that it should be diminished to the extent of 448 acres." Now, Sir, I must say that that is a most unfair passage to have inserted in that answer, in the way in which it is introduced. What was it that Mr. Rennie recommended? Carry out your system of training walls, allow the water to expand over the foreshore as it did before, and then having reference to the adjustment between the proper width of the channel and the training walls, which I recommend as the boundary up to which the property should go, the result will be, that you will affect 448 acres of surface out of the whole at full tide. Sir, is there honesty or fairness in contrasting that with the abstraction of the 95 acres, which has been made by Mr. Palmer and Brothers, and Mr. Ellison and Mr. Leslie, at that convex shore which was the subject of Mr. Calver's Report. I say, Sir, to represent that as at all a parallel case, was a most unfair representation of the circumstances. These gentlemen will explain it, if it becomes at all necessary. I am told, Sir, that the 95 acres referred to there, were on the north shore; that would be the Northumberland Docks.

(*Mr. Clayton.*) No.

Mr. Webster.

24th January 1855.

(*Mr. Webster.*) Then it only makes the allegation worse, because I am told that the only explanation of those 95 acres is this, that it was an abstraction made under the direction of the Corporation of Newcastle. Therefore, Sir, as this was a letter of which the Town Clerk was cognizant, to have contrasted the 95 acres of solid land made with the 448 acres which Mr. Rennie proposed to be dealt with, only makes the contrast worse for the party who makes it.

"They tell you on the authority of Mr. Lawes, a barrister, Mr. Abernethy, an engineer, "whom we never heard of having had any experience in the management of navigable "rivers, and of Mr. Calver, the surveyor above named," (the legal character of this language is certainly very precise,) "that the encroachments by which the channel of the "river has been sought to be deepened and improved, are unnecessary and injurious to "the river, and that the works have been based upon erroneous principles;" but they do not tell you what are the opinions on this subject of the most eminent engineers of the day—of Cubitt, of Rendel, and of Stephenson. Sir William Cubitt, in his evidence before the House of Commons, expressed his entire approbation of the whole of the works complained of, and Mr. Rendel, speaking with that caution for which he is distinguished, thus expressed himself. "Generally speaking, I have not the slightest grounds for "objecting to the lines which have been adopted, but there may be some cases in which, "if the thing were to be gone over again, some alterations might be suggested, but they "would be very trivial." Sir, what were the opinions of those gentlemen upon the then state of facts I have already called your attention to. I have called your attention to Sir William Cubitt's opinion, as expressed in the Report printed in the appendix to the inquiry before Captain Washington. I have called your attention to Mr. Rendel's opinion upon it. But, Sir, you have before you, or can have before you, the exact proceedings which took place before that Committee; they have been printed by the Commissioners in a pamphlet, a copy of which I see lying here. And, Sir, I again repeat that it is a very unfair mode, to make a contrast between evidence given by those gentlemen upon a Bill then before Parliament for the promotion of a great public work, whereby the water space would be interfered with by docks and other works, but from which a considerable return of water would be made, and which interference, great though it was, might be justified under the circumstances, the whole circumstances being under proper Parliamentary control, and under the control of the Admiralty. It is an unfair contrast to make of that state of circumstances, and the abstraction of solid land without authority, in the way it was done in the case of Palmer, Brothers, and Mr. Leslie, and Mr. Ellison, without the authority of the Admiralty, and according to a plan which was not disclosed to the body of the Commissioners, but which was executed under the representation that it was to be experimental, and for a limited time, and which grew up haphazard, so to speak, without anybody knowing exactly how.

"The Commissioners are charged with having rejected the motions of the gentlemen "signing the letter, directed (as they are pleased to state) to the abandonment of the "'unsound and ruinous system of engineering which has been practised.' The majority "of the Commissioners have repudiated the quackery of amateur engineers, and have "acted on the opinions of the first engineers of the day." Now, Sir, perhaps my learned friend will tell us who are the first engineers of the day, who have sanctioned this abstraction of Messrs. Palmer, Brothers, and the other abstractions which have been made without authority, and without plan, and which differ entirely from the abstractions made under the authority of Parliament, and the control of the Admiralty, such as took place in the Jarrow Slake and the new Northumberland Docks.

"The Commissioners are accused by implication of sacrificing the interests of the river "confided to their care, for the sake of increasing the estates of the adjoining land-"owners, and Mr. Calver, in language, which, no doubt, has been reproved by his employers, "deals in insinuations against individuals of high honour and integrity." I presume that those gentlemen of high honour and integrity, against whom I am sure he did not make, and the minority of the Commissioners never intended to make, any imputation, are the honourable member for Gateshead, and the distinguished persons who are supposed to constitute the firm of Palmer, Brothers, and Bowes and Company, and who are represented so well by Mr. Philipson and the Town Clerk. They certainly never intended to make any insinuations, excepting this; that following out their own interests as men are found to do, unless interfered with by the Admiralty or Parliament, or some superior power, the result has been, that they have got this portion of land to be enclosed by the application of the river funds at the public expense. "On the part of the Tyne Improvement "Commissioners, I can with truth say, that since they came into office they have not "sanctioned the enclosure of any portion of the foreshore of the River Tyne, unless in "cases where such enclosure was obviously for the benefit of the navigation." Sir, that is not the pretence under which that enclosure was made of Palmer, Brothers, and Company. It was alleged to be experimental, and to be temporary, and in the case of Mr. Leslie, it was obtained as a hardening of the surface between the half-tide level and the shore; and yet, notwithstanding that these operations were so (obviously for the benefit of the navigation), the majority of the Commissioners and their officers did not dare, when the application was made for licence which led to these works, to put it upon that footing; they represented it as experimental, as only this and only that, but the result you now know.

Mr. Webster.

24th January 1855.

"The title to the soil of the Tyne is at present the subject of contention, and will be "decided by the legal tribunals of the country, by which alone it can be properly decided. "The Tyne Improvement Commissioners can, however, have no title to it. They "take their property by transfer from the Corporation of Newcastle, and the soil of the "river is expressly reserved to the Corporation in that transfer." Now, Sir, I do not know that there is any such reservation of the soil in the Act of Parliament of 1850.

(*Mr. Clayton.*) Expressly in the Act of 1850, if you look at it.

(*Mr. Webster.*) I shall be obliged to my learned friend to point it out to me, because I shall have a word to say upon it.

(*Mr. Clayton.*) I will point it out to you in a moment.

(*Chairman.*) What section is it?

(*Mr. Clayton.*) It is section 61 of this copy, Sir.

(*Mr. Webster.*) "Provided always, and be it enacted, that subject to the liabilities on "the Corporation by this Act expressly imposed, this Act or anything therein contained "shall not take away, lessen, prejudice, alter, or affect any estate, right, or interest what-"soever of the Corporation of, in, or to the soil of the port and river, or lessen or prejudice "any of the estates, lands, property, and effects of the Corporation, or any of the tolls, "rates, dues, duties, rents, issues, profits, or other income whatsoever, of or payable to the "Corporation, or any of the powers, authorities, franchises, customs, usages, immunities, "rights, or privileges of the Corporation." That, Sir, is a saving clause of all they have which is not transferred by this Act. But, Sir, if my construction and contention be true, that they never had any claim to these foreshores except as conservators, (and the rights which are incident to conservators are well known to the law, and so are the duties,) where those conservancy rights have been transferred, both in point of law and equity, all that the Corporation had in respect of them has been transferred; if they have not been transferred, they only ought to be; and that will be a matter which may be the subject of further legislation, if any Court of Law should decide that they have not been so transferred. But, Sir, what is the fact, as I am told, respecting this title to the soil of the Tyne? It is a question which was reserved probably with reference to the Northumberland Docks, as to who was entitled to receive the money in respect of the foreshore, and the soil that was taken from the river by them; and that is a contest (and a pretty contest it is) between his Grace the Duke of Northumberland, the Crown, and the Corporation of Newcastle, who, as I contend, never had, and never could have, any rights except in respect of the conservatorship of the river, which are now gone, by reason of the transfer of those powers. But I say again, Sir, denying that there is any right of this kind beyond the conservatorship, which I say is transferred, that if there be any legal right left, it would be a very fit subject for legislation hereafter that that right should be dealt with, because what is the result, and what is the state of things? It creates so large a personal interest in dealing with those foreshore rights, that it leads to the deposit of ballast there, and to other matters out of which a great deal of the injurious effect upon this highway, and not only the injurious effect, but the obstruction of further improvements, has resulted.

"The Commissioners are accused of having refused a return, moved for by Captain "Purdo, to show how much the Tyne had been encroached upon during the three years "and a half that the Commission had been in operation. Captain Purdo made no such "motion; he moved for a return of encroachments since the year 1840, which would have "been both useless and expensive." Now, I must say I think that is the most miserable special pleading that any learned Recorder or learned special pleader ever settled in his life. I must not say any learned Recorder, for we have a most learned Recorder upon the Commission. I therefore beg to apologize for the expression. The gentlemen have said in their letter that Captain Purdo asked for a return of the quantity taken within the three years and a half; the majority say he made no such motion, because he asked for it from 1840. Why, a return from 1840 would have included the last three years and a half; and then, by reference to those plans now on the table, and which were proved publicly before the Committee of the House of Commons, as showing the state of things in 1849, the minority of the Commissioners would have had a pretty good knowledge of the state of things which had taken place. It is curious to observe how these gentlemen change their colours. Mr. Rayne was alarmed at it as being dangerous; the gentlemen who settle this letter think it useless and expensive; and that was the reason why Captain Purdo was not to have it. I am making my statement from such documents as have been before me. Mr. Clayton has access, and the majority have access, to all matters, and are in a far better position than I am; for you are aware probably that no facility has been afforded, of course, to the minority in any way of having this case properly conducted, as it was not likely it would be. The majority being charged in this bill of indictment, as my friend Mr. Clayton calls it, it is not likely that they would have afforded any great facility. But I say, Sir, as regards this question of return of the quantity of land, the gentleman who disposed of it represented it to be dangerous; the gentlemen who settled this letter represented it to be useless and expensive.

"The effects which the six gentlemen signing the letter ascribe to the acts of the Conser-"vators of the Tyne have no foundation in fact. It is not true, as they state, that the "navigable depth of the Tyne is diminished; on the contrary, the sailing channel is now "so much improved, that vessels, which could formerly navigate the river only at spring "tides, can now navigate it at neap tides." Sir, all I can say is this: there has been a

Mr. Webster.

24th January 1855.

miraculous charge very recently, if such is the state of the case; but you will hear the evidence which some of our witnesses will give, to justify that assertion in the letter:— "It is not true, as they state, that the main channel of Shields Harbour is worse; on the "contrary, it is decidedly improved, both by the diminution of the Droitwich Sand, and of "the In-Sand; and the depth of the water on the bar has been increased." Sir, I presume that these gentlemen have gone, at some time after a flood, or possibly have found a greater depth of water there than at some other time, to which the evidence is supposed to have reference. But, Sir, that is only a very small part of the question with which you have to deal, of the complaint which the minority make; and they do allege that there has been no substantial improvement, and that the steps which have taken place, not only the acts of commission but the acts of omission, have produced a state of circumstances which has perpetuated the old grievances, and has prevented any further improvement.

"All these assertions and all these imputations are, however, a mere preface to the main "object of the writing of the letter, viz., to prevent, if possible, the bill for the formation "of docks on Jarrow Slake by the York, Newcastle, and Berwick Railway Company "receiving the sanction of the Legislature. They develop their views as to these docks "in the following paragraph,—'the process of encroachment;'" and then they refer to the paragraph on which I have already commented. Then they say,—"At the time when "this letter was written, a Bill was before Paliament, which has since passed into law, to "enable the York, Newcastle, and Berwick Railway Company to form docks at Jarrow "Slake, of an extent to accommodate 500 ships, and calculated, in the opinion of the most "eminent engineers, to benefit the general navigation of the river. The opinion of "Mr. Calver was opposed to these docks; but select committees of both Houses of "Parliament, by unanimous decisions in favour of them, have testified their sense of the "value of Mr. Calver's system of engineering." I think, Sir, that is hardly a fair way of dealing with a gentleman of Mr. Calver's known experience. That is a matter, as I said before, which has been fully considered by Parliament, and it is not for me to say that the grounds which were laid before them were not quite sufficient to justify the conclusion. At all events, it is a case wholly different from anything like the present, that being done by Act of Parliament, sanctioned according to a proper plan, and according to lines which must receive the consent of the Admiralty.

"The Corporation of Newcastle, to whom the right to the soil of the river was reserved "in the Act of 1850, have been in the habit of requiring small pecuniary acknowledgments "from individuals for the use of portions of the bed or soil of the river. At a recent "meeting of the Commissioners, Mr. James C. Stevenson moved that an application be "made to the Corporation of Newcastle for an account of those receipts; to which "the Corporation replied, that inasmuch as the soil of the river, in respect of which "these payments were made, was expressly reserved to them, there was no use or "propriety in rendering to the Commissioners an account of them. The whole amount of "their annual payments is 14*l.* 10*s.*" I say, Sir, that that being the measure of it, it is high time that that question should be set at rest, and that any rights which the Corporation retain should be transferred to the Commissioners.

"The statement contained in the letter of the six Commissioners, that 'there are "'numerous instances in which the interests of the river and those of Newcastle are at "'variance,' is utterly unfounded. The town of Newcastle, situate in the higher part of the "navigation, and containing nearly 100,000 inhabitants, has the largest and deepest interest "in the river Tyne and its navigation, and in the success of the operations of the Commis-"sioners, inasmuch as the Town Clerk of Newcastle and the Treasurer held their offices "at the time of the passing of the Municipal Reform Act, and were entitled to compen-"sation if displaced (which compensation would have been, under the Act of 1850, a charge "upon the Commissioners). It was obviously the more economical and the most beneficial "course that they should be continued in their offices under the Commission." Now, Sir, I must say that I think these gentlemen were very hard pressed when, in answer to a statement alleging that there are numerous instances in which the interests of the river and those of Newcastle are utterly incompatible, they could only adduce that trifling financial reason as to the compensation which the Town Clerk might receive, he having been the Clerk of the former Conservators. That, Sir, was a matter again of compromise. Of course, the Corporation of Newcastle would never have allowed, if they could have helped it, that the important office of Clerk to the Commissioners should be placed in other hands, and that was one of the provisions which the Shields people were obliged to consent to. Sir, what is the difference of interests referred to? Are not the Corporation of Newcastle distinctly interested in making as much land as possible, and in having the river improved at the sacrifice of anything up to the town of Newcastle? Is their interest comparable to the interest of Shields in the improvement of the bar, and the harbour where the larger vessels must remain? Do my friends forget the coal dues and other questions in which they must have a direct interest, and this, above all, that the time cannot be far distant when Shields will be made perfectly independent of Newcastle, and when that monstrous anomaly, that there shall be no quay in Shields, and that the tradesmen of Shields are obliged to have their goods sent up to Newcastle and down again, will be removed? Sir, the interests are most conflicting, and no one of the gentlemen conversant with this matter will have any difficulty in calling your attention to many instances in which the interests of Newcastle are as distinct and diametrical as can possibly be from those of Shields, and so distinct and so diametrical, as to call in the loudest possible manner for the interference of the Legislature, by placing this state of things under the control of some independent parties.

Mr. Webster.

24th January 1855.

Then, Sir, they refer to a passage in Mr. Calver's Report, which I really will not trouble you with, because it is recommending placing the Tyne, with other ports, under an acting Conservator; but they say that "such a suggestion, at variance as it is with every "principle of the British constitution, would scarcely be received with approbation by a "British Minister. The attempt to impose such a despotism as it implies on the Tyne "would be indignantly resisted by all classes on the sides of that river." Sir, I have only to tell you that the gentlemen of Shields (the ship-owners) beg and pray that they may be placed under such despotism: they know full well that the public interest will then be consulted, and they will be emancipated from the despotism which the Corporation of Newcastle has exercised upon them in various ways in former times, with the narration of which I will not now attempt to detain you.

Now, Sir, that was the answer attempted to this very consistent and temperate letter of these six gentlemen, who have been the minority of the Commissioners. There is only one other document, Sir, which I must trouble you with, which is, the reply of the six gentlemen to that statement of the Corporation of Newcastle. It was sent on the 3d of August. "We deem it unnecessary to remind the Lords of the Admiralty of the great national "importance of the harbour and navigation of the Tyne; and we would, without any "preface, bring before their attention the system of management now followed by the "Tyne Improvement Commission, of which body we are members. We would refer their "Lordships to a letter which we, on the 3d of June last, addressed to the First Lord, for "a statement of the facts regarding the system of river management pursued, first by the "Corporation of Newcastle, and, since 1850, by the Tyne Commission, the constitution of "which body practically continues to the Corporation, and, to some extent, to the same "individuals, the control of the river. In answer to that letter the Chairman of the "Commissioners, in the name of the Board, or rather of the majority, has addressed a "letter to Sir James Graham. We do not think it necessary to advert to the personalities "and imputed motives regarding us, which that letter contains, and which we most "decidedly repudiate. The letter alleges that the encroachments on the tidal area of the "Tyne, of which we complained, were founded on and have partially carried out the advice "of the late Mr. Rennie, 'that it should be diminished to the extent of 448 acres.' Such "an allegation displays the most lamentable ignorance of the principles and operations laid "down in the very valuable report of that eminent engineer, and illustrates a remark "by Mr. Calver, R.N., in his report of the 17th of December last, that the members "of the Board are 'generally unacquainted with the matters on which they are called "'upon to deliberate.'" Now I must say that I think you will come to that conclusion in the same terms. You have here people at Shields, ship-owners, most deeply interested and generally acquainted with their business, and they say that the gentlemen who are distracted by the numerous businesses incident to the Corporation of Newcastle, are not very likely, without reference to the standing interests of the town, to be so well acquainted with the matters upon which they have to decide, as the Shields gentlemen are. "The embank-"ments proposed by Mr. Rennie, to bound the sailing channel, were restricted to a little "above half-tide height, in order, as he says, that 'a principal part of the space embanked "'will still remain as a receptacle for tidal water;' and in opposition to contracting the "river by solid embankments, he states that 'as a less quantity of tide water would thereby "'be admitted, it would have less effect in keeping down the bar;' and again, 'a great "'extent of space to receive tide water, is essential to the maintenance of a good outfall.' "Mr. Rennie's report remained neglected by the Conservators of the river, and it was "nearly 30 years before any river works were commenced, and these works have been "carried out on the very opposite principles of tidal economy. In his report to the "Commissioners in 1851, Mr. Rendel advanced the same principles as Mr. Rennie, "regarding tidal water; but the system of solid embankments and high-water transverse "jetties, is still persevered in by the majority of the Board. So far from having acted "upon the opinions of the 'first engineers of the day,' there is no consulting engineer "responsible for the encroachments which the Commissioners are carrying on; Mr. "Walker's responsibilities as consulting engineer being confined to the piers in the sea. "The Chairman asserts that 'the sailing channel is now so much improved, that vessels, "'which could formerly navigate the river only at spring tides, can now navigate it at "'neap tides.' This is a great exaggeration. But we do not deny that by means of steam, "vessels can navigate with somewhat greater draught of water, the violently contracted "channels caused by the jetties; but we maintain that the navigable capacity (depth and "breadth combined), has very much deteriorated. The dredger has very lately been "employed in endeavouring to restore the sailing track through a new shoal, which has "sprung up directly opposite Messrs. Palmer's encroachment, where the rising of the bed "of the river has followed the extensive embanking of both sides, and its contraction "to less than two thirds of its original width. It is now of greater importance than ever "that there should be a stop put to the present system of embanking estates from the "river bed. But the advocates of the system have taken courage, by the extent to which "has been permitted to go on unchecked, and these encroachments may be expected to "proceed now more violently than ever: and as they proceed, the decay of the Tyne will "proceed likewise. The narrows, at the lower end of Shields Harbour, are now narrower "than ever, and it is only by the aid of steam-tugs, that the entrance and departure of "ships is generally practicable; and while the bar remains of fluctuating depth, its navi-"gable width seems permanently reduced. For the importance of Shields Harbour, in "respect of refuge and berthage, we would refer their Lordships to the statement of facts

" in favour of making the Tyne a harbour of refuge, laid before their Lordships by the deputations of the Tyne Commissioners, and several municipal and other local bodies. Yet it is these valuable qualities of the Tyne, that will, we firmly believe, be destroyed, if the whole amount of enclosure now avowedly in contemplation be carried out. We estimate the ultimate loss of tidal area at between 700 and 800 acres, out of the original area of 1,694 acres, between Shields Narrows and Newcastle Bridge, or above one third of the whole scouring acreage of Shields Harbour. The deep-water berthage of Shields Harbour seems to us unquestionably due to its contracted width, naturally compared with the great expanse of Jarrow Slake and the upper reaches of the river, and the effect of making the river of one uniformly contracted channel must be to make Shields Harbour of the same uniformly shoal depth which prevails in the upper navigation. This total change in the geographical features of the estuary of the Tyne, involving as it does, consequences so disastrous, ought not to be permitted without the fullest inquiry, and the consent of the Admiralty as supreme conservators on behalf of the national interests at stake. We feel that the importance of the crisis demands the fullest inquiry, and we would strongly urge upon their Lordships the propriety of procuring the appointment of a Royal Commission, to inquire into the facts of the case, into the extent to which the interests of the Corporation of Newcastle and other landowners are at variance with the interests of the navigation, into the constitution and operation of the Commission for the Improvement of the Tyne, and the necessity of a better representation within the Commission, or of a control by a central authority over the acts of the Commission, on behalf of the national interests which are imperilled in the management of so important a navigation. And considering that the process of encroachment is going on day by day, and that these encroachments can never be restored when once made, and that no money compensation can ever be an equivalent for the ultimate injury, we would further suggest to their Lordships to take, without delay, any legal or other proceedings within their power, to arrest further encroachments, until the repetition of the abuse shall have been secured against for the future."

Mr. Webster.

24th January 1855.

That, Sir, is the state of the bill of indictment, so to speak, or the matters which led to this Commission, and which contain the questions upon which your opinion will be prayed. That, Sir, is the way in which the matter stood before the issuing of this Commission. There are various other points which have been raised from time to time by the Commissioners, or the minority of the Commissioners, as matters connected with the question of the encroachments on the Tyne, and the defects of the navigation, matters, many of which are, perhaps, rather more of omission than of commission. For instance, one, and a very large and important class, is the totally neglected state of the banks. You must have seen the state of dilapidation which exists in many portions of the sides of the river. You must, I think, have been struck with the contrast exhibited between the state of the river near Newcastle and the state of the river a very little way down. You have had your attention called to the recommendations about Bill Point. You may remember that was cut down to a certain extent, so as to give a better view, but that the rock below was left untouched, so that, as regards the sailing channel, things are no better, or very little better, than they were in Mr. Rennie's time. That is a matter to which the attention of the Conservators has been called times without number. It was called to it by Mr. Rennie, by Captain Washington, by Mr. Rendel in their reports, and these things remain not only in the then state, but something worse than that, for you will find, Sir, that these transverse groins of Mr. Brooks are positively projected beyond the Bill Point. So that, although everybody, Mr. Rennie, Captain Washington, and Mr. Rendel, insisted upon that being cut off below low water, so as to make a deep channel there, and improve the bed of the river there; and though they have actually done it by taking away a part of the rock above the surface of the water, yet there have been jetties put out there, which increase artificially the defective state of things which existed naturally; and, literally, the zeal of Mr. Brooks for these jetties, or of those who instruct him, is so great, that he has made obstructions to exist artificially which did not exist naturally. I hear gentlemen laugh. Sir, if I have been inaccurate in my statement, it will be set right by gentlemen whom I shall call; or we shall have the pleasure of hearing those gentlemen who are making a joke of any statement which I may have made, give their opinion upon it. But, Sir, more than that, we allege acts of omission as regards tide observations, as regards plans, as regards everything that is essential to a general system of treatment. Nothing whatever has been done. It really has been, so far as the Commissioners know, and as the public know, living pretty much from hand to mouth. And matters have gone on in a way which certainly is very unbecoming in the conduct of a river like the Tyne.

Now, I have called your attention, in going through the minutes of the Commissioners, to the way in which these questions have been raised by the minority as dissentients. I will just call your attention to one or two instances in which similar questions have been raised by those who act, to a certain extent, with the majority. For instance, I have already called your attention to the fact that, on the 9th of June, Mr. Rayne proposed that no ballast should be placed behind the groins, and also to another notice of motion of the same day, respecting the alienation of the foreshore rights. And, Sir, I find another gentleman, a Mr. Allhusen,—I do not know exactly what his connexion may be,—but on the 20th of September, there was made this most wholesome motion, with reference to the powers which we shall pray you to recommend for the adoption of the Legislature. Mr. Allhusen had said that he would give notice of the following motion,—" That Par-

Mr. Webster.

24th January 1855.

" liamentary powers be applied for, with a view to obtain authority to apply the proceeds " of land to be taken from the river for the benefit of the funds of the Tyne Improvement " Commission." It is quite clear that that is a motion which would never have suited the views of the majority of the Commissioners, influenced as they are by the considerations I have suggested; and it must be so, from the position in which they are. How was it disposed of? " As, however, it was somewhat different from what he had intended," (this gentleman gets enlightened, Sir,) " he begged to substitute in its stead another " motion." What is the motion substituted? That " Parliamentary powers be applied " for to carry out the river works according to the plan agreed upon by the River Line " Committee." This River Line Committee, Sir, I believe, like many other things, is a thing existing in name, but not in action. Therefore, you have this gentleman, when he is in a peculiar state of mind, proposing a motion of the most wholesome character, and really a remedy for the encroachments and abuses to which the Tyne is subjected; but when he gets a little enlightened, another motion is substituted for it, which is of no actual value, because it is a thing which should have been done long ago.

I have called your attention, Sir, to the inability of Captain Purdo to obtain the return which he insisted upon, namely, as to the quantity of land abstracted; and, Sir, I have submitted that a great deal which has taken place in the Tyne upon these questions, and which has led to the mischief, has resulted, not exactly from misrepresentation, but from the strong influence which must have been brought to bear upon the officials and others who were to advise upon this matter, leading at all events to the direct interest of those in whose favour the land was made. And, Sir, it is very remarkable, that even Mr. Brooks himself appears either to have changed his opinion entirely, or to have no idea of the extent to which these things would proceed; for on an inquiry which took place in 1846, Mr. Brooks holds this language; and I mention it as evidence of the uncertainty in which everything of this kind is in the Tyne. He is asked this question by Mr. Anderson, who was a South Shields gentleman, and a large shipowner. I believe he has left the neighbourhood now. Addressing Mr. Armstrong, he says, " You were good enough, Mr. Chair- " man, to ask me a question, which I was sorry I could not answer with accuracy, namely, " how many solid acres had been abstracted from the river? Now I should like to know " how many acres are included within Mr. Brooks' projected improvements altogether? " *Engineer.*—I should say not 24 acres from one end of the river to the other, solid " works on both sides. *Mr. Anderson.*—I mean, when all the spaces between jetties are " silted up. *Engineer.*—But they are not covered, and their effect is to deepen the water " in front of them. *Town Clerk"* (Mr. Clayton, I presume).—" It is the number of acres " that is wanted, not the effect. *Mr Hunter"* (another gentleman of considerable distinc- " tion in this district).—" If you inquire of Mr. Joseph Crawhall, he will tell you. " *Engineer.*—Two hundred and one acres of the entire space, out of 2,296 acres, or about " one eleventh of the whole. Rennie proposed to diminish the superficial area by 448 " acres, or about one fifth of the whole. So you see mine is less than one-half of Rennie's " proposition. And you should bear in mind that this reduction is not a reduction of the " cubical contents of the water." Now, Sir, I do not mean to make any imputation upon Mr. Brooks about that, he will know that perfectly well; but I only instance this, to show how little this gentleman contemplated the present state of things at that time, no longer ago than 1846, just two years before these questions were beginning to assume the definite shape which they have now done, and when he himself had laid down lines upon that plan which I handed in, and which I think had been the subject of various reports. You will find that these lines, which he had laid down, had been the subject of reports some years before, and that he had actually proposed docks which are also laid down on this plan; so that his attention had been fully called for some years to all the circumstances of the Tyne. At that time he represents that the total abstraction would only amount to 24 acres; and on another view of the case, not to one half of what Mr. Rennie proposed that is to say, so far as regards the question of solid land, not 24 acres, and so far as regards the question of Mr. Rennie's abstraction, not one-half of what Mr. Rennie proposed. Now, Sir, I do not mean to say that a gentleman is not at liberty to change his opinions, and I have no doubt Mr. Brooks has engineering reasons perfectly sufficient to justify it, because Mr. Brooks is a person of too much experience to adhere to an opinion, and not to change it if he sees ground for it; but, Sir, I only adduce this as part and parcel of the general system of uncertainty in which everything has been kept in the Tyne, by reason of the Corporation not having found it answer their purpose to adhere to any systematic plan as a whole, the foundation of which must have been proper river lines, and proper restrictions with regard to dealing with tidal water space.

Sir, I have already pointed out to you that the only dredging which has been done, has been a dredging at certain places, for the purpose really of curing defects which were incident to the system of treatment to which the river had been subjected, and that, Sir, is in itself very strong evidence of the loss of tidal action which has taken place. It is not sufficient to represent, as perhaps may be represented here, and into which I certainly do not mean to go, that the river is better in some places than in others; the question is a much larger question; it is a question of the state of the bar and the capacity of the river as a whole, as regards tidal volume and tidal action; a question which can only be settled conclusively to your minds upon a most minute and careful investigation of the observations of Mr. Calver, the observations of Mr. Rendel, and such other information as you may think it necessary to call for. It would only be misleading you, and I should really only be

Mr. Webster.

24th January 1855.

occupying time uselessly, if I attempted to pursue anything of the same course which was pursued upon the inquiries before Captain Washington, or the inquiries before the House of Commons, or the other inquiries which have taken place. Those facts have been ascertained conclusively; the engineers have reported; legislation has proceeded upon the assumption, by the admission of the Corporation of Newcastle itself, that the state of the river required a total change of conservancy and of management; and what we allege is this, that nothing of that kind has been done; that matters have been left pretty much practically as they were, and that they are in a state to require an interposition on the part of the Legislature. I am supposing, of course, that anything which you may think fit to recommend will be immediately followed by legislation.

Sir, I have only one or two observations to make upon what has taken place since the issuing of the commission. The commission has been read, and it is in terms sufficiently general to raise every question that we care about, because when you have ascertained the disease and the cause of it, the remedy can be very easily provided. Your secretary was pleased to address a letter to the Commissioners on the 5th of December, which, after quoting the terms of the commission, states, "I am directed by the Commissioners appointed by Her Majesty to conduct the said inquiry, to enclose a copy of the commission, and to "request that you will be pleased, after convoking a special meeting of the Improvement "Commissioners to receive this communication, to acquaint me, for the information of the "Commissioners, with such particulars as to the present state of the navigation of the Tyne "as may appear to you most interesting and important, and especially, 1st, whether the "Board of Improvement Commissioners, since its reconstruction in 1850, has worked "efficiently; 2d, what works are now in progress for the improvement and deepening of "the river Tyne; 3d, the annual income and expenditure for the above purpose, with its "application in detail; and that the replies to these questions may be accompanied with "such further observations as may be thought necessary by the Board. I am further "directed to say, that if any difference of opinion should be found to exist amongst the Improvement Commissioners on this subject, the Commissioners request that the dissentients "will state their sentiments in a separate letter, a copy of which should be communicated "to their colleagues."

Now, Sir, at a meeting on the 11th of January, that letter of the Commissioners was taken into consideration, and Mr. Clayton produced the proposed answer; and I certainly was a little bit amused at the solemnity of the gentleman's face yesterday, in talking of not having received the bill of indictment, when I remembered the terms of that answer, which is about as concise as anything well can be. To the first question he says, that the Commission has worked well or efficiently. Certainly, when he was aware that upon all the vital questions of river management there had been repeated divisions, repeated motions, repeated notices, repeated protests, carried on from almost the first meeting of the Commissioners, and that resolutions on very vital points had been carried by a bare majority, or by the casting vote of their own mayor, a member of the council, it only showed his own ability to forget all that, and then to say that such a commission had worked efficiently. But, Sir, has it worked efficiently? Can you accept that statement, which I deny most distinctly, and which is denied in the answer which the dissentients have sent, and which would have been sent before but that they really had not the opportunity of getting together until yesterday; the Royal Commission came upon them rather before they expected it. I deny most distinctly that the Commission has worked efficiently; and I assert that the evidence of that, is the protests and the notices of motion to which I have called your attention, and that practically the same state of management, or rather mismanagement, the absence of management, has continued since the creation of the constitution in 1850, as existed up to that time, and which led to the reports of the Admiralty Inspectors and to the interference of the Legislature.

Now, Sir, on the second point, as to what works were in progress, Mr. Clayton replied—"That under Acts of Parliament there were the piers, the Hayhole Dock, with 2,000 feet "of river wall on Rennie's line, and the Jarrow Dock with 1,800 feet on Rennie's line. "That under the Commissioners' general powers, there were the removal by the dredge of "what remains of the stones; a half-tide was on Rennie's line for 6,000 feet at Hebburn, "the completion of the river wall at Wallsend Bight, and general dredging. That they "contemplated the further removal of Bill Point and Whitehill Point, so far as the docks "were completed; also the removal of Newcastle Bridge." Now, Sir, as regards those works being on Mr. Rennie's lines, it is not very material whether they are on Mr. Rennie's lines or not; the Northumberland Docks, and the Jarrow Docks, and the piers, are being carried out under Parliamentary sanction, under the authority of the Admiralty, who will take care that such lines are adopted with reference to the existing state of things as will, so far as they can, best provide for the case. But I believe, as a matter of fact, it is not upon Mr. Rennie's line that the Admiralty have settled, at all events, the Northumberland Docks, or even the Jarrow Docks; that is very immaterial; it has been settled by an authority to which we do not object, and which we regard as the proper authority to settle these matters. As regards those other matters, Sir, we say, that true it is that some of those matters are going on, but that they are carried on in an imperfect manner, without reference to a system, and wholly in contravention, or at all events, if not in contravention not in accordance with what was supposed to be the intention of the Legislature, that they would be done under the new conservancy. And as regards the piers, those are under a distinct Act of Parliament, and that is a matter which is also

Mr. Webster.

24th January 1855.

under the jurisdiction of the Admiralty. As regards the question of dredging, I have already called your attention to the fact that what was communicated by the engineers was the course which ought to have been followed out, and that it was throwing away money to dredge until the training walls and other matters of that kind had been executed, so as to allow the channel to do its own work to the extent which it would do, and which it is well known it will do, in all cases of this kind.

Sir, on the 22d of January 1855 the following letter was addressed by the minority to the Royal Commissioners: "Gentlemen,—The Commissioners appointed under the Tyne "Improvement Act, 1850, who addressed the letter of the 3d of June to Sir James "Graham, and the Memorial of the 3d of August to the Secretary of the Admiralty, "respectfully submit in reply to the letter of your Secretary of the 5th of December, and "to the letter adopted by the majority of the Commissioners at their meeting on the 11th "of January, as follows. 1. They believe that they shall establish, to your satisfaction, "that the Board of Commissioners, as established by the River Tyne Improvement Act, "1850, has not worked efficiently, but, on the contrary, has pursued the system of en-"croachments on the tidal area, and the management of the river, which it was the object "of that Act to obviate. 2. Works, as mentioned in the letter of the majority of the "Commissioners above referred to, are proposed or in progress; but other works and "encroachments, detrimental to the navigation of the Tyne, have been executed, or are in "progress, or proposed; and we object to many of the proceedings of the Commissioners in "reference to those works, and to the omission of works and duties, upon grounds stated in "the letter of the 3d of June, and in the Memorial of the 3d of August, and at meetings "of the Commissioners, all which grounds are well known to the Clerk, and to those who "have attended the meetings of the Commissioners. 3. It will be our duty to call your "attention to details of the annual income and expenditure, and the particulars of the "application thereof in support of the above complaints. Lastly, it will be our duty to "submit to you that the navigation of the Tyne and the interests of the public are pre-"judicially affected by the method of proceeding with the works, and that the Board of "Commissioners have succeeded by bare majorities in frustrating the recommendations of "the successive Admiralty engineers, and the intentions of the Legislature, in passing the "River Tyne Improvement Act, 1850."

With regard to the question of accounts, Sir, all that the gentlemen whom I represent have thought fit to do, is to refer you to the published accounts. I shall not trouble you at any length upon that point. I shall call a witness who will give you some information as to the nature of the income and as to the nature of the expenditure, and who will, I think, satisfy you, that these furnish abundant evidence that there is, if not a misapplication, at all events, not a very judicious application of the river funds.

I am not aware, Sir, that there are any other matters upon which it is necessary that I should detain you, as to the general way of proceeding with the works; the minority have, through me, called your attention to the general points which they were anxious should be brought before you, and which they trust will receive your acquiescence. They say shortly, in conclusion, that the system which has been pursued has been an inconsistent one, and a system upon no regular plan; a vicious system in many respects, and in many of its details, and that the operation has been to exclude tidal water where it is of the most vital interest that tidal water should not be excluded, but that the period of the water upon the bar should be prolonged as much as possible, in the way which Mr. Rendel describes. They say, that this is a question in which the Shields party, the shipowners, are most vitally interested; that although you may deal with portions of the river by means of river walls, so as to give an apparent depth in one part, yet if you deal with the river in such manner that you improve the condition of the bar, and improve it to the greatest possible extent, you must of necessity improve the river all the way up to the extent of the tidal flow. They point to the proper principles of river management, at all events, in a river of this sort, which has its peculiarities, and which differs essentially in its features and constitution from other cases which have been referred to in some of the Reports, and upon which I will not dilate, as for instance, the Dee, the Clyde, and other instances which have been adduced. They say, that the principles which Mr. Rendel and Mr. Rennie laid down are the true ones, and that you must look to the improvement of the bar as the question upon which the general economy of the river must depend. They say further, that the land which is made by the exclusion of tidal water, is land that ought not to belong to the frontagers in the way which has hitherto been pursued, but is land in which the public have a direct interest, and which ought to become part of the conservancy fund, so to speak, so that if considerable value is added to it, the river will get the benefit of it, in precisely the same way that the river will get the loss of it if there is a deterioration from the execution of such works. And they say, that practically speaking, in a river of this sort, having such a magnitude of local interests upon it, and to a certain extent conflicting local interests, it is impossible that it can be administered satisfactorily, excepting there be a control of quite a distinct character from any which exists under the present conservancy.

I believe now, Sir, I have called your attention (I fear, at almost too great a length) to the various matters. Of course, the principal part is the documentary evidence, and the Reports which have been already laid before Parliament, and before the surveying officers, and therefore the extent to which my evidence will go, will not be very considerable. I should ask you, Sir, for a summons for Mr. Danson, the harbour-master, with his books. I understand that he has a register of arrivals, and so on. I understand there are two

gentlemen whom we should wish to have here to give evidence before you; Mr. Danson, with the book which he has, being a register of arrivals and departures, and Mr. Pearson, the pilot-master. I should also ask for a summons for Mr. Lamb, on this principle, that we are anxious to present before you for the cross-examination of my learned friend, all those gentlemen who have become parties, so to speak, to this inquiry, by invoking the assistance of the Admiralty and of the Legislature. *Mr. Webster.* 24th January 1855

(*Chairman.*) Who is your first witness?

(*Mr. Seymour.*) The Commissioners will pardon me for making an application to them. Mr. Clayton was only aware, in the course of yesterday, that counsel would be employed on the opposite side, and I received last night a telegraphic message, and arrived here this morning. The advantage which my learned friend, Mr. Webster, has, is very great, from the fact of his having been previously engaged in these matters. I approach this quite as a novel question. I think that the favour which I am going to ask of the Commissioners would in the end save their time; because if I am called upon with my present information, not having had time for a consultation with my clients, to cross-examine any gentleman called by my learned friend, I may go into questions which possibly, upon further consideration, I might not bring before the Commissioners; and, therefore, in asking for a suspension for the day, after the five hours' speech which has been made, I think I am not doing anything selfish, but only aiding the Commissioners, as I think that I am not in a situation to proceed with the cross-examination, in the position in which I am.

(*Chairman.*) Then we will adjourn till to-morrow morning at 10 o'clock.

(*Mr. Webster.*) I certainly, Sir, do not resist that application. I think it will, perhaps, tend to shorten the inquiry. I have called your attention to the subject in considerable detail. The only matter which occurs to me which might save a little time, is, that I should wish you to inspect one of those large Plans which are down below, and which were used in Parliament. They might be put up, and you might employ half an hour in that way. But I am quite ready to adjourn. I will hand in this reduced Plan of one of those, Sir, for your own use, which it may be convenient to refer to.

(*Chairman.*) Perhaps you will give the Secretary the names of the gentlemen whom you wish to have summoned.

(*Mr. Webster.*) Yes, Sir.

(*Mr. Armstrong.*) And the documents that they are to bring with them.

(*Mr. Webster.*) I will, Sir.

Adjourned till to-morrow, at 10 o'clock.

Thursday, 25th January 1855.

[*Some Plans were exhibited.*]

(*Mr. Webster.*) Before we begin with the oral evidence, Sir, I will just take the liberty of enumerating the documents which I referred to yesterday, and which I consider to be in evidence, that there may be no mistake about it hereafter. There is the Inquiry before Captain Washington, and also his Report. The Appendix to that Inquiry before Captain Washington contains a great number of the papers that I referred to, and which will be referred to by some of the witnesses. For instance, it contains the Shipowners' resolutions; Fryer's Letter of 1800, showing the general history of the matter; Smeaton and Wooler's Report of 1772; Mr. Rennie's Report, and various documents relating to the history of the Tyne. The document which I hold in my hand, is the Admiralty Inquiry before Captain Washington, the evidence here, and the Appendix containing those documents. Then, Sir, there is Captain Washington's Report upon that, which is a paper printed by order of the House of Commons in 1848. Then, Sir, in 1850, there is the Report of Mr. Lawes and Mr. Abernethy upon the two bills,—the Shields Bill, similar to that introduced in the preceding year, and the one introduced by the Corporation, which subsequently became the Tyne Conservancy Act. Then, Sir, in 1852, there is Mr. Walker's Report on the Hay Hole Dock and the Piers, and in the same or the next year there is Captain Vetch's Report, settling the lines of the wall of the Northumberland Dock, that is, the Hay Hole Dock. Then there is Mr. Calver's Report to the Admiralty on the Jarrow Slake. Those are the Admiralty documents. Sir, then of the other documents, there is the letter of Mr. Armstrong, of 1836, with an Appendix; there is a document relating to the Port of Newcastle-upon-Tyne, of 1843, signed by Messrs. Dyson, Hall, and Parkes, the Parliamentary Agents. I take them in the order of date, Sir, because they add to the history which Captain Washington gives in his Appendix. Then there are the Proceedings of a Special Meeting of the River Committee, upon a deputation from the Shipowners Society, to which I referred yesterday, of November 1846. Then, Sir, the next document in order of date, is Mr. Rendel's Report of 1851,—the Appendix is with the Conservancy Commissioners. The next is Mr. Edward Killwick Calver's Letter to the Commissioners, which I referred to yesterday. The next is Mr. Walker's Report and Plan on Piers, of November 1853. Those, I think, are the pamphlets, Sir. Then, Sir, there is the Letter of the 3d of June from the minority to Sir James Graham, which is a Parliamentary paper; there is the reply of the 21st July of the majority, which I read yesterday, also to Sir James Graham. Then there is the *Mr. Webster.* 25th January 1855

Mr. Webster.
25th January 1855.

Memorial to the Secretary of the Admiralty of the minority in reply, which I read yesterday, of the 3rd of August. Then there is the Letter of the Admiralty, acknowledging the receipt of those documents, and dated the 14th of August, to the majority, that I will give in; I read it yesterday. Then there is the Commissioners' Letter of the 5th December; the Letter of the majority of the 11th of January; and there is the Letter of the 22d January, which was handed in the day before yesterday. I believe those are all the documents. Perhaps the Clerk will have the goodness to produce the Minute Books of the Commissioners.

(*Mr. Clayton.*) They are here.

(*Mr. Webster.*) There are one or two matters which we want to verify; perhaps you will leave them in the custody of the Commissioners.

(*Mr. Clayton.*) Yes; I shall want to refer to them.

J. Straker, Esq.

JOSEPH STRAKER, Esq., sworn.

Examined by Mr. Webster.

1. I BELIEVE you are a shipowner, and a merchant, and coal owner?—Yes.

2. How many years have you known the Port of the Tyne?—Fifty or sixty years.

3. I believe you have taken an active part in all the attempts at improvements that have been made in the Tyne?—I have given my services to the best of my ability on all such occasions.

4. You are also one of the Commissioners under the Tyne Improvement Act?—I am.

5. You reside at North Shields?—Yes.

6. And are appointed as the representative of that port?—That is so.

7. You say that you have taken an active part in the various attempts at improvements that have been made relating to the Tyne?—Yes.

8. Were you a member of the North and South Shields Committee of 1848, that promoted the Conservancy Bill?—I was.

9. I believe there were committees both at North Shields and South Shields?—There were.

10. Did you attend the meetings of the Committee in Parliament, and give evidence upon the Bill?—I did.

11. I think you were also examined before Captain Washington on the Admiralty Inquiry on that Bill?—I was.

(*Mr. Webster.*) That is at page 26, Sir, of the printed evidence.

12. (*To the Witness.*) I think that was one of the plans, showing Mr. Rennie's lines (*pointing to a Plan*)?—That was the plan exhibited before the Committees of the Lords and Commons.

13. I believe it purports to show Mr. Rennie's lines of 1813?—It does; those are Mr. Rennie's lines marked red.

14. You have known this river, you say, for a great number of years; which was the first principal encroachment upon it that has been continued, and has affected subsequent proceedings?—The first one that took my more immediate attention was near Wellington Quay; the first encroachment, I should say, commenced at that lower groin just opposite Howdon.

15. Is there now a place known upon the river called Wellington Quay?—There is.

16. Is that a considerable encroachment?—It is.

17. What was the effect of it upon the river?—The effect of that encroachment was, in the first instance, to cause an eddy below it, to silt up the dock immediately below it, and to interfere very much with the staiths below, with the shipping places at Hay Hole.

18. By whom was that encroachment made?—By the Corporation of Newcastle.

19. About when did it begin?—I am not prepared with the exact date; it was before 1849 I think; it was before the first meeting which we had in London.

20. Has it been going on from that time to the present?—It has been going on from that time to the present, and is now nearly, but not quite, complete.

21. As regards the present state of that in front, and the effect of the washing of water upon it, how is that at the present moment?—I think, perhaps, if I were to step over myself to the plan, I could more distinctly point out what I am going to say. This is the point which was started at; and the encroachment which is complained of was not as appears by this line, but it was an encroachment beyond that line; I should say something like to that (*showing the same*).

22. The red line is Rennie's line?—It is. You can very easily imagine that if an encroachment extends out to there, tapering off up the river, the effect will be, that the set of the tide against that must send the water across to the opposite side; that was the effect, for it silted up this dock and shoaled the loading berths here so much, that the dredger was obliged to be employed for months together here, to keep the channel open. So sensible were the Corporation of that effect, that they cut off the point and threw it back, so that at the present moment, I believe, it is on Mr. Rennie's line, allowing the ebb of the tide a freer course down the river. An attempt was made by the engineer to obviate that by carrying out works on this side of the river (*the south*). To counteract the effect which this had in diverting the channel across to this side, he carried out works on the south side to restore the current of the river, and to throw it across to Hay Hole. That has also since

been removed—thrown back; it will be made appear by some other plans, most likely to be laid before you, and the line is now more uniform on both sides; but that is the immediate effect of the works here.

23. (*Mr. Armstrong.*) They are now on both sides, on Mr. Rennie's line?—They are not on both sides on Mr. Rennie's line exactly. I am not prepared to say whether they are without Mr. Rennie's line or a little within; they are not confined to Mr. Rennie's line; therefore I cannot show you by this plan exactly where they are; but there are plans to show it. That plan (*another Plan*), I think, shows it.

24. (*Mr. Webster.*) You think that that plan shows the present state of things, but it does not show Mr. Rennie's line?—I think so. Of course, never having seen that plan till this moment, I can only speak from the appearance of it. If it is Mr. Calver's plan, it will show it distinctly.

25. Your impression is, that Mr. Calver's plan shows the state of things, but it does not show Mr. Rennie's line?—Just so.

26. You say that as the Wellington Quay was first constructed, it was constructed not upon Mr. Rennie's line?—Not upon Mr. Rennie's line, beyond Mr. Rennie's line.

27. And the effect of that was injurious below, and led to its being altered?—That was so.

28. What was the effect generally of the alteration on the north side, and the absence of a regular wall on the south side, on the Hay Hole?—The effect was to silt it up, more or less, from time to time, and to cause a great expense to the Commission in dredging.

29. You are now speaking of since the Commission came into operation; you used the word "Commission?"—Yes, I speak generally—the conservators; I am not prepared to say whether it was the present Commission or the old one.

30. Since that, I believe, docks have been sanctioned under an Act of Parliament in Hay Hole?—Yes.

31. Were those docks rendered in anyway necessary by the silting up, and this irregular encroachment of Wellington Quay?—Yes, I should say they were.

32. What is the present state of the front of that quay, (you say it is in progress or nearly finished,) as far as regards the ballast washing into the river?—The present state of the quay is this, that where frontages have been let off to private individuals, they have been made to form proper quays to protect the ballast and material behind them; but where it still remains in the hands of the Corporation, there are no such walls made; merely a rubble wall, made of chalk or any other hard material that they could easily come at, as the Commissioners themselves must have seen on going down the river, and that is the only casing or protection to it at present.

33. I will just ask you a question about the bar in Shields Harbour I presume, of course, as you have been a shipowner for many years, your attention has been a good deal directed to the state of the bar and the state of Shields Harbour?—My attention has been constantly directed to it for at least the last half centuary; 50 years ago I was captain of a ship trading to this port, and I then discharged my cargo generally in Dents Hole, and the depth of water that my ship used to draw at that time was from 14 to 14½ feet. I never attempted to go higher up the river with her, because the parties to whom I was chartered, and for whom I brought cargoes into this port for several years, had their raft yard and ponds above Newcastle Bridge, and therefore it was not thought advisable to encumber Newcastle Quay with ships discharging timber, and they never did go higher up than the place I have spoken of. Therefore, whether they could have proceeded to Newcastle Quay or not, I am not prepared to say, but I think not. I think they could hardly have gone up then at 14½ feet water.

34. Are you aware, that in 1836, Mr. Armstrong, in a pamphlet of his, which has been put in, states that the Tyne at that time affords the advantage of bringing up vessels to the quay, drawing 14 or 14½ feet water, and where they are situated within seven miles of one of the finest harbours in the Kingdom?—Yes, I have read that in Mr. Armstrong's paper.

35. Does that, on the whole, agree with your experience?—It does. I believe that is perfectly correct.

36. You knew the river long before that?—Yes.

37. At what time did you cease to be the captain of a ship?—I commanded a ship for nine years, and then I ceased to go to sea, and I took a graving dock in South Shields, and a building yard, and continued in that for several years; the fact is, I became possessed of more than one ship, and I could not go to sea and attend to them all, and therefore I stopped on shore, and from that time to the present I have continued a shipowner.

38. According to the best of your experience and information, what do you consider to be the state of the bar, and the Narrows, and the entrance generally now, as compared with what it was then?—As far as the bar is concerned, I am not prepared to say it is either better or worse; in fact, I have no means of judging correctly; it is a shifting bar; with north-east gales and freshes in the river, we generally find that it improves a little, because while the sea stirs up the sand on the bar, the fresh carries it out to sea, but we have no data by which I can ascertain exactly what the state of the bar is. I can only judge by the ships that enter the harbour and go to sea loaded, and to give an honest opinion upon the subject, I should say that it is much in the state it was with respect to depth. I have been told, but I do not know of my own knowledge, that it is contracted in breadth.

J. Straker, Esq.

25th January 1855.

39. That is, the bar —The bar.

40. You have mentioned that the bar is subject to considerable variations from what we call natural causes, as the direction of the wind and freshes, quite independent of the quantity of water coming in and out?—Yes.

41. To what extent have you known, or have you reason to suppose that the bar has varied from those causes alone?—I should think, from my own observation, that it has varied from time to time perhaps a foot.

42. I asked you about the state of the narrows, and the channel, and the bar, have you any information to give respecting the state of those?—Yes; I know perfectly well of my own knowledge with respect to the narrows, though it has always been called a deep channel, and from its contracted space, it must remain deep, yet that the breadth of it has diminished considerably in my time.

43. To what cause have you referred that?—I think, perhaps, I had better confine myself to the facts, without adducing causes: it is more of an engineering question. I could only attribute it to one cause, that there is not the quantity and force of water seeking a passage to the sea from the river; but whether that is the real and the only cause, I will not pretend to say.

44. However, as a matter of fact, within your experience, has there been such an interference with the sides of the river as to amount to a considerable abstraction of tidal water?—There certainly has, to a very great extent.

45. What is the state of the depth of water in Shields Harbour?—That is also a thing which varies very much. It is a curious fact, but it is a fact, that the greater crowd of ships you collect in Shields Harbour, the better state the harbour is in. A tier of deep water ships invariably scours the sand and material from under their bottoms, and makes deep water, and when the tiers are crowded over to the southward close to the sand, it has the effect also of scouring away the sand. We find it to be the case in the summer season, often when ships are not prevented getting to sea, and the harbour is clear for a considerable time, that the in-sand comes over considerably further to the north than while the harbour is crowded with shipping. But in the winter season, in this season of the year, when gales of wind prevail, and there is a high sea upon the bar, and many heavy ships are collected in the harbour, the sand scours away very much.

46. Then the effect of the presence of the ships is to lead to a deepening and scouring of the harbour?—It is.

47. Do the ships produce any effect in obstructing the amount of water either flowing in or flowing out?—I should say, no; the water will find its way in and find its way out, this very effect, in making itself space in spite of the crowded state of the harbour, shows that.

48. I will ask you, as a shipowner, whether the depth and width of the entrance across the bar, is a matter of the greatest importance?—It certainly is. I consider that the bar, being as it were the key of the whole navigation of the port, is a thing of the first consideration, and that anything which tends to contract or lessen its depth of water, is to be most carefully avoided.

49. Do you remember the passage in Mr. Rendel's report, referring to the importance of lengthening the time of the tide for the passage of vessels across the bar?—Yes.

50. You concur in that?—I do. It is quite obvious, I think, to anyone at least that has seen the crowded state of this harbour, frequently containing probably 1,000 or 1,200 sail of ships. I believe as many have been in it, and when I tell you that I have seen as many as 300 or 350 sail of ships go to sea in one tide, you can only come to that conclusion, that it is of the greatest consequence that we should have the greatest quantity of water for as long a time as possible upon the bar.

51. Do you concur in the opinion that the operations ought to be directed mainly to that object?—To that and deepening, as I stated before; everything that will deepen the channel and increase its breadth.

52. Is the depth of the bar, the making it as deep as possible, of the same or of greater importance than the depth of water at Newcastle Quay, for instance? Which is of the greatest importance?—I should say the bar, decidedly; because a great many ships which have to come over that bar and proceed to sea with cargoes, cannot by possibility approach Newcastle Quay; they must both discharge their cargoes in the deep-water berths in Shields Harbour, and load their cargoes outwards again.

53. Is the course of business such, that the larger ships have to discharge and seek their cargo in Shields Harbour?—That is so. Many of them, not of the very largest size, but many ships discharge a part of their cargo, and then proceed up the river, but a great many never come higher than Shields Harbour.

54. I believe it is only of late years that Shields has been made into an independent port?—Yes.

55. In what year did that take place?—That I am not prepared to say. I have no notes.

56. I believe that was a matter about which the Shields people took a great deal of interest for many years?—It was.

57. And was obtained with great difficulty?—It was.

58. Was that, so to speak, the first step of emancipation from Newcastle?—It was one of the steps. I am not prepared to say that it was the first.

59. You have spoken of the importance of the bar; do you concur, so far as you as a ship-

owner understand them, in the views which are expressed in the Reports of Mr. Rennie and Mr. Rendel?—I do.

60. Do you understand the general views contained in those Reports to be substantially the same?—Yes, that is my understanding.

61. Having reference to the opinion which you have given as to the importance of the bar, do you conceive that the first operations ought to have been directed to completing the lower works?—I am of opinion that the river should have been treated as a whole, not to have been tinkered and patched up in the way that it has been, here and there and anywhere, but that it should have been treated as one great whole measure, which should have been commenced at the bar, and worked upwards. That is my opinion.

62. Is there any part of the river in which you can point to anything having been commenced and completed as a whole, excepting up at Newcastle?—No. From Whitehill Point down to the bar, I do not know of anything, excepting that a few of the stones were removed, after a great deal of stir was made about it by the Shields people, where previously there was a very dangerous shoal, between the Narrows and the bar, and upon which several ships have knocked their keels out coming in; in fact, it stretched about two thirds or half way across the channel, and made it also very dangerous to ships going down to sea. With that exception, I do not know of any work between Whitehill Point and the bar, that has ever been done.

63. You attended the Committees in Parliament in 1849: was that a spot of which the engineers of the Conservators did not know the existence at that time?—I think that was so.

64. You say that the river has been tinkered and not treated as a whole, and that the only complete works have been up at Newcastle; has there been any money spent anywhere excepting up at Newcastle?—By whom?

65. At all events, before 1850, was there any?—Whom by?

66. By the then conservators, the Corporation of Newcastle?—I am looking to see if I can fix upon any place; there was no place which took my attention, excepting Newcastle Quay, that was completed.

67. Was there any considerable work anywhere, excepting up at Newcastle?—Not that I am aware of.

68. Do you remember the evidence of Mr. Armstrong, the Treasurer, upon that point, before the Committee of the House of Commons?—I remember Mr. Armstrong's evidence being given; what part do allude to?

69. Do you remember its being treated rather as a joke, that the Corporation of Newcastle should spend money anywhere excepting at Newcastle?—I do remember it.

70. You remember evidence to that effect having been given?—Yes.

71. Since the new conservancy have come into operation, of which you are a member, has there been any material improvement in the mode of treating the river?—I think not; the same system has been pursued.

72. Has the management been substantially in the same hands?—It has.

73. From what does that result?—It results from a part of the Commissioners being composed of members of the Newcastle Corporation, who have always been able to carry a majority in the commission.

74. Whatever may be the causes of it, has the result been that the same system substantially has been pursued?—It has.

75. I will go to one or two particulars. I think you have told us already that, from the view which you take of the importance of the bar, you consider anything which diminishes the tidal water is of serious consequence?—I do. I consider it the very first consideration to keep the mouth of the harbour clear, and to keep deep water there.

76. In your opinion, has the quantity of tidal water entering or going out been diminished?—No question of it.

77. From what causes?—From the enclosing of portions of the river and forming it into solid land, instead of using half-tide walls, as recommended by Mr. Rennie and Mr. Rendel, and making, as I have stated before, solid land where previously the tide flowed.

78. In your opinion, is there a considerable distinction to be drawn, both so far as regards the effects upon the river and commercially, so to speak, as to the difference between docks and solid land? Do you object, as a matter of principle, to the formation of docks under proper regulations?—By no means; I am decidedly in favour of docks wherever they can be procured.

79. But you object to the making of solid land?—I would even sacrifice a little of the tidal space for the purpose of obtaining docks. I would go as far as that; nay, I would go a little further, and I would say that wherever it is shown to be absolutely necessary for the purposes of trade, even in such cases they might dispense with a little of the tidal water; but, as a general principle, I object to removing any tidal water, excepting for such purposes as I have now named. And I would say more especially, that as the very same object can be attained, in my opinion, and in the opinion of those engineers whom I have quoted, by half-tide training walls, I can see no necessity for making full-tide embankments and solid land.

80. The result of the use of half-tide walls is, that it leaves a portion of the tidal volume to return?—That is the case with half-tide walls.

81. Would the operation be in time to fill up to the level of the half-tide?—I think it would. I think in time the effect would be to fill up to the top of that half-tide wall; but

J. Straker, Esq.

25th January 1855.

then the advantage would be this, that while it was so filling up, you would have time to dredge the shoal parts of the river and to make water in the channel, so that you might at least get the same quantum of water that was displaced behind those half-tide walls. Another advantage would be, that all the silt and sediment so collected behind those walls would relieve the channel of the river to that extent; and there is another advantage, that, supposing the whole of this river to have full-tide walls down its sides, in cases of frost and ice in this river, which often accumulates in great quantities, there would be no place for the ice to land upon the sides of the river; it would be confined to the channel, to the strength of the tide, and might accumulate in such quantities upon the tiers at the mouth of the harbour that the moorings would not hold the ships, and they would be broken adrift. What the consequence would be in such a case is more than I can say. I may tell you that I have seen in a perfect calm, without any ice in the river, without any wind, ships drive out of this harbour from their moorings with two anchors ahead, and go upon the rocks; therefore, had there been at such a time ice or a gale of wind from the west, the consequence would have been a loss something similar to what they had in Sunderland, where they are much in the position of a river with full-tide walls, because there is no place for a ship to haul to. And another evil I may be allowed to allude to as a shipowner and a practical man, and seeing the working of this river, I think all the craft upon the river would be placed, under such circumstances, in a most dangerous position. At present where those inlets are left, the wherries and other boats coming deeply loaded down from Newcastle could haul in upon the shore out of the way of the ice, but if there were no sides to haul to, what must be the consequence? They must come in one compact body with the ice, and go out to sea; there would be nothing else left for them. It is quite clear they could not haul to the shore upon those full-tide walls, because the moment they came upon the ground they would upset and sink in the channel.

It has been suggested at my elbow, how could they haul ashore if there were half-tide walls? Of course they could not haul over the walls; but it must be quite plain that as long as there was water over the half-tide walls, they could haul in there and be perfectly safe. When the tide fell below that, there would be no opportunity of doing so, except by leaving openings in the half-tide walls.

82. And had you had the 445 acres, which Mr. Rennie recommended to be left at the back of the half-tide walls, it would have left a considerable extent of berthage for the object which you have mentioned?—Yes; though gentlemen do not look forward to such a thing, perhaps, at present, I do look forward to the time when some of those places will be valuable to form docks, and, therefore, instead of having to remove a ballast heap to make docks, we should have a place half made to our hands.

83. Then, is it your opinion that full-tide walls ought never to have been allowed to abstract land to any extent, except for the purpose of docks?—That is my opinion; or, as I said before, for some great commercial purpose.

84. And, I presume, under Parliamentary or Admiralty control?—Yes.

85. You told us that your view of this river is, that it should be treated on a whole and with half-tide walls. Would the system of treating it with half-tide walls have admitted of your dredging out from the channel, and placing the materials behind those walls, so as to have made a good channel and secured the material there as the works went on?—That is my opinion, and I intended so to have stated; I have it upon my note here. The fact is, that by filling up those recesses with foreign material, the ballast that comes from London, you shut yourself out completely from any place to deposit the dredged material out of the river. Now if they had confined the filling it up to that, I should never have complained, because at any rate, in that case, they were only depositing behind the wall what was taken out of the bed of the river, but when they filled it up with foreign material, ballast brought from London by the ships, then I say there is a great cause of complaint, because what position shall we be in presently? We are getting a new dredger; we have one already, we are getting another; we shall want a great deal of dredging in this river. Where are we to deposit the material? Is it proposed to get hopper barges to carry it to sea; that is good as far as it goes, but if a gale of wind comes on, which we are constantly subject to here, and there is a high sea upon the bar, how are the hopper barges to get to sea? Therefore, it is the more necessary that such places should be left for the deposit of the dredged material when these hopper barges cannot be carried out to sea.

86. I believe there have been considerable discussions at the meetings of the Commissioners as to the propriety of adopting a system of hopper barges?—There have.

87. Has that been reported upon by Mr. Stevenson, and been the subject of various discussions?—It has.

88. Do you look to that, and also to the deposit in bad weather, as two systems for disposing of the ballast that the Commissioners ought to have at their disposal?—Yes.

89. Do you consider it of importance, with reference to the ballast question, that all these spaces over which the tidal water ever flowed should have been left in the control of the Commissioners for the purpose of ballast of the dredged materials?—Yes.

90. You have told us that as long back as fifty years ago you had a ship of 14 feet water that used to go to Dent's Hole.—Yes.

91. Do you remember the case of the Sardinian frigate a short time ago?—I do.

92. How much water did she draw?—I cannot speak from my own positive knowledge, for although I went down to the docks when she was placed upon the blocks to see what water she drew, I could not find that she had any water-marks upon her, and being lame

from an accident, I could not get down the dock side to measure her. I have heard from Mr. Smith, the builder, what water she drew; he says she drew 16 feet; she was more than that when launched, but as they had not water down the river, they had recourse to various means to lighten her draught, such as putting casks under her after end, and various schemes of that kind to lift her up abaft, by which means they reduced her to 16 feet water. In the meantime the dredger was employed to make a channel for her to get her down to Shields, and I think she lay about three months before she could be got to Shields.

93. Do you know what it cost the Conservancy to dredge her a channel, or what was the number of tons?—I have heard 20,000 tons of ballast.

(*Chairman.*) We had better have as little hearsay evidence as possible.

(*Mr. Webster.*) This quantity, Sir, he would know as a Commissioner.

94. (*To the Witness.*) A good deal of discussion has taken place as to the alteration in the depth of the water at different portions of the channel. Has any account been taken or credit been given, in those discussions, for the general lowering of the bed which has taken place?—No, certainly not.

95. Do you know of the bed having lowered?—Yes; I know of my own knowledge that that has happened at three portions of the river. Whether it has been general through the river or not, I am not prepared to say; but to my own cost I know it in two of the instances; for when I was concerned in the dock at South Shields, a creep took place, as it is technically called here, of a colliery working immediately under the dock, and under the river, and in the morning the dock sill was 2 feet lower than it was the night before; the very beam across the dock was broken and standing up so (*describing the same*); that was one instance. A very curious instance was, that after I had done with that dock and had Howdon Dock, the very same circumstance occurred there between night and morning: when the men came to their work in the morning, they found the dock bottom started up and the whole premises sunk down about 2½ feet. The very same thing occurred at Mr. Smith's dock up at St. Peter's. Those are three portions of the river that I know of; one at the foot, the other in the middle, and the other at the top, where the bed and soil of the river and the land adjoining went down bodily to that extent.

96. Has there been any general plan or section of the river with systematic soundings, which would enable you to form an accurate opinion of the state of the river at different times?—I have never been able to see it.

97. A good deal has been said at different times about the dredging of Tyne Main Shoal: is that the principal improvement up to Newcastle Quay?—That was the great improvement between Dent's Hole and Newcastle Quay. Tyne Main Shoal was composed of a hard material, which resisted the effect of the tide and the flood, and remained a shoal in my knowledge. I think I knew it for 25 years as an impediment between those two parts.

98. When was that first commenced to be dredged?—I have not the dates; but I know that it was first dredged by Mr. Danson, the harbour master, and afterwards, I think, by Mr. Brooks.

(*Mr. Brooks.*) No.

(*Mr. Straker.*) Then it was by your predecessor. It has been dredged; it has been cut through, I am quite positive of that part of it.

99. (*Mr. Webster.*) A good deal has been said about this. Was the dredging commenced before Mr. Brooks was the engineer of the Conservators?—I think so; but Mr. Danson himself is here and he will tell you.

100. Has there also been dredging in Pelaw and Hebburn shoals?—Yes.

101. Were there groins or jetties placed there?—Yes, up at Pelaw.

102. Did those groins or jetties answer?—I always considered that they did the very reverse; that they were the most mischievous things which could be placed upon the river. It is a thing I have always objected to.

103. I believe there have been considerable discussions at the Conservancy Board since it was first established, upon the subject of these transverse groins and jetties?—There have been a good many.

104. Have you from the very first taken a course adverse to them?—I have, invariably.

105. So far as regards this particular case of Pelaw, you say your opinion is that they did not answer the purpose?—Yes.

106. What is the nature of the operation? does it make holes in one place and take the sand down to another?—The effect is this, that the difference, I consider, between a half-tide wall and a cross jetty, to be in favour of the half-tide wall, inasmuch as it leads the tidal water in the proper channel without in anyway impeding its ebb and flow; whereas the cross groins stop the flow and ebb of the tide, and whenever it meets with that resistance it rushes out and ploughs up a hole in the channel of the river at the ends of these jetties, making the bottom of the river uneven.

107. Then is the effect of those jetties, which you have invariably resisted, to make a hole at one place and transfer the sand to another?—That is the effect, in my opinion.

108. Notwithstanding these jetties which were placed at Pelaw, was dredging necessary?—Dredging was obliged to be had recourse to.

109. You were speaking of jetties, which you described as the Pelaw jetties?—No. I was speaking of the Hebburn jetties.

110. And you said, I think, that those jetties did not answer the purpose which was intended?—They did not answer the purpose intended to the extent that we were led to suppose they would by Mr. Brooks.

J. Straker, Esq.
25th January 1855.

111. And was dredging necessary notwithstanding?—I should, perhaps, state, that a considerable time after the jetties were put out, Mr. Brooks applied to lengthen the jetties. He found he had made them insufficient in the state they were in, and he applied to have them lengthened. I, for one, opposed that; but he succeeded in getting leave to lengthen them, which, he said, would answer all the purpose that he required. After being so lengthened, he came back to the Commission to require the use of the dredger to do the thing, as I considered, which Mr. Brooks was to have done by the lengthening of those jetties, and he was granted the use of the dredger; therefore I attribute, and, I think, not unreasonably, to the dredger whatever has been done in the channel, and not to the jetties.

112. An opinion has been expressed, generally, that the improvement, such as has taken place in the river, has been due to dredging, and not to the jetties?—I think to the dredging decidedly more than to the jetties. I do not mean to say that jetties have not had effect in some particular places; but whatever improvements have taken place have been principally by dredging and not by jetties; that is my opinion.

113. And you object to jetties, and advocate and approve of half-tide walls, on the ground, as I understand you to say, that the former produce holes in one place and deposits in another, whereas the half-tide walls would produce an uniform line?—Yes; and more than that, that wherever you put a cross jetty it tends to make solid land of it, especially if it is a high full-tide jetty.

114. And in those places where jetties have been placed, in your opinion half-tide walls ought to have been placed, and the material, if dredged, placed behind those half-tide walls? — That is my opinion.

115. Do you remember that you made a proposal, I believe the first proposal, that as early as December 1851, when jetties were proposed, you made a distinct motion against it?—I did; on that and every occasion I opposed it.

116. Do you know a jetty near the west end of Hebburn Quay, which Captain Washington recommended to be taken off 30 feet?—I know the jetty; but I do not remember precisely the circumstance of his ordering that.

117. Sixty feet?—You had better get that from another party.

118. Has that jetty been shortened or lengthened since that recommendation?—My memory does not serve me precisely upon that point. You must get it from another party.

119. I will ask you a question about Bill Point. Are you aware of the advice of Mr. Rennie and Mr. Rendel as regards that point?—Yes.

120. How has it been dealt with by the Conservators or their engineer?—Instead of cutting off the point, the groins have been carried out to the extent that the point was before, thereby confirming the existence of the point instead of removing it.

121. Have you also taken part in the motions which have been made against dealing with ballast in the way that has been done?—I have frequently.

122. Is it the fact that very large quantities of ballast, for which the Commissioners have paid for a place of deposit being provided, have been washed into the Tyne?—That has happened to a great extent, and must continue to do so, in my opinion, while unprotected except by those chalk walls.

123. I believe the Corporation at the present moment receive 10*d.* a ton from the Conservators for providing a place of deposit for ballast?—I think that is so; but I think you had better get that from another party, as I have no figures before me from which I can speak.

124. However, they do receive a sum of money?—They receive a sum of money, and make a considerable profit upon it.

125. You know that the Corporation of Newcastle receive a sum of money per ton from the Conservators, and make a considerable profit upon it?—Yes; that I know.

126. I believe it appears by their accounts?—That will appear by the accounts.

127. Do you remember any motions at the Board of the Commissioners objecting to the sum which the Corporation of Newcastle received for ballast?—Yes; I remember Mr. Poppelwell, I think it was, objecting to it.

128. Was that objection overruled or voted against?—It was.

129. And have the Corporation continued to receive an amount for ballast from the Conservators since that time from which they derive a profit?—Yes.

(*Mr. Armstrong.*) That is, for finding a place of deposit?

(*Mr. Webster.*) Yes, Sir.

(*Mr. Straker.*) That place of deposit being in the river.

130. Is the place of deposit, within which the Corporation place this ballast, upon land that was part of the tidal area?—Yes.

131. Are you acquainted with the various applications that were made, and discussions that took place, respecting the encroachments of Palmer and Brothers, and Bowes and Company, near Jarrow Quay?—Yes, I remember it perfectly; there was nothing, perhaps, which caused more discussion among the Commissioners than that very circumstance. The circumstance is this: after a resolution had been come to by the Commissioners, that a half-tide wall only (not a full-tide wall) should be continued from Hebburn Quay down to Jarrow, the half-tide wall, after being formed near to Palmer's, was observed by some unaccountable circumstance not to depress its level as the creeping of the collieries occasioned, but to be rising out of the water in the most extraordinary manner. Mr. Brooks was asked how this arose. Mr. Brooks knew nothing about it; if it was so, it was with

Palmer and Company. I myself proposed in the Commission, that the Clerk should address a letter to Messrs. Palmer and Company, insisting upon their reducing this half-tide wall, which had risen nearly to high water to the half-tide level again. Palmer and Company pleaded innocent of the whole matter, and it was only when we had recourse to a view of the place, and when the Commissioners in a body went down to inquire into this matter, that Mr. Brooks was brought face to face with Messrs. Palmer, and they told him to his face that he had raised the wall and not they, and he could not deny the fact. Those are the facts of the case, give them what colouring you please. And Mr. Brooks went further on that occasion, and said, that it was his wish and his intention to make solid land of it. I think that was the expression he made use of.

132. Have orders been made by the Commissioners to prevent the encroachment, or to endeavour to prevent the encroachment which has occurred at that place, namely, Palmer and Brothers?—Yes, they put a stop to it, excepting the five acres and nine-tenths, or some such quantity, pointed out at the lower end of the quay, which had been granted previously to them.

133. I believe you have also been present at the discussions which have taken place respecting these foreshore rights which are claimed by the Corporation?—Yes.

134. Do you remember Mr. Allhusen's motion respecting the foreshore rights, to the effect that if made into land at all, the value of such land should be proceeds applicable to the general conservancy purposes?—Yes.

135. Do you concur in that opinion?—I do.

136. Are there instances in which, as matters now stand, the Corporation of Newcastle and the landowners have interests conflicting with the interests of the conservancy of the river?—There certainly are; it must be the interest of every landowner to get as much river frontage as he can, and it must be the interest of the Conservators of the river to preserve that frontage, except for the purposes which I have already stated.

137. I will just ask you, in the terms of the Royal Commissioners' letter, whether the Conservancy Commission, since its establishment in 1850, has worked efficiently and for the objects which, so far as you know, were contemplated when the Act passed?—I can only say that in my opinion it has not, or I should not have signed the letter which I have.

138. You were a party who signed the letter, I believe, and you have acted with the minority throughout?—Generally.

139. Of course, there have been at times differences of opinion upon other matters even among the minority?—Yes; I have never hesitated when a measure was introduced, let it be from the minority or the majority, that I considered for the benefit of the river. I without fear of contradiction say, that I have invariably voted that way, let it be for one party or the other. I have no interest myself to serve.

140. Excepting the general interests of the port?—Except the general advantage of the public and the port.

141. Were that letter of the 3d of June to Sir James Graham and the memorial of the 3d of August addressed to the Admiralty, which were signed by you, perfectly *bonâ fide*, and dictated by what you believed to be the real interests of the conservancy of the port?—That is my opinion.

142. Is the coal trade of the port increasing considerably?—Very considerably.

143. Would the reservation of the portions of land within the half-tide walls between them and the foreshore be an important space that might hereafter be required by the coal trade?—Yes; it might be required for that or any other purposes; it is impossible to say for what purpose it might be required.

Cross-examined by Mr. Seymour.

144. Can you give the date when the first encroachment was made at Wellington Quay?—I do not think I can give you that.

145. Was it made in the time of Mr. Anderson?—It was commenced in Mr. Anderson's time.

146. Was that before 1840, or would it be about that date?—I think it would be about 1838 or 1839, but I am speaking from memory only.

147. You say that the effect of that was to create an eddy below, and to silt up the docks?—Yes.

148. Afterwards, when Mr. Brooks became the Corporation engineer, he persisted in making works higher up the river, so as to counteract that effect?—He persevered in those works.

149. You have referred to the encroachments at Hay Hole,—the encroachments at Hay Hole are shown upon the map of Mr. Rennie as partly forming his plan?—No.

150. You see where the docks are?—Yes; you mean the line where those docks are?

151. Yes. At that time can you say whether the formation of any docks in the area of those encroachments was contemplated?—At the time that the works at Wellington Quay were commenced?

152. Yes.—No, I think not; I never heard of a dock at that time.

153. Has not the formation of the docks been projected and encouraged by the present Conservators of the Tyne?—It has. I myself am one of the Committee, and do encourage and do everything in my power to forward them.

154. Suppose that the plan of Mr. Rennie had been adopted, and the jetties and encroachments made according to what appears upon that plan, can you form any approximate

J. Straker, Esq.

25th January 1855.

estimate of what the cost would have been for that undertaking?— I am not prepared to do so.

155. But under the present system, now that the docks have been made, on whom does the cost fall,—on the conservators or the public, the cost of carrying out the making of the docks in the space pointed out in Mr. Rennie's plan?—It would fall upon the Dock Company.

156. Upon the coal-owners, I presume?—Upon the Dock Company.

157. Not upon the funds of the Conservators?—Not upon the funds of the Conservators.

158. Then, in point of fact, they have carried out by making docks that which was the design of Mr. Rennie, without the charge falling upon the funds of the Conservators?—It is not strictly upon the line of Mr. Rennie; it comes further out than Mr. Rennie's does.

159. However, substantially that is the case?—Substantially that is the case, that the Conservators are relieved of that expense; but I would add to that, that substantially the docks have been required by the projections made above; for I think if those docks had not been made, we should have been in continual hot water with the proprietors of the staiths who have shipped their coals there, because they blame us (it is not for me to say whether rightly or not) for causing an eddy and a silting at their staiths there, and therefore it was one of the best measures that could be adopted, in my opinion, to make a dock, and remove their cause of complaint.

160. However, without going into the question of what they consider their claims, I presume, after what you have said, that you consider the docks a very great improvement?—I do.

161. You spoke of a ship of yours; I think you said of 14½ feet of water, the cargo of which you used to discharge at Dent's Hole?—Yes.

162. At what state of the tides used you generally to bring the ship up?—It depended entirely upon the time when we entered the harbour: we generally went up there to discharge. If it was the very worst of the tides, we probably should have to wait a tide or two. I cannot give you the particulars of it further than that we generally carried the ship up to Dent's Hole to discharge her cargo. She was the only ship I ever commanded; I commanded her nine years; and she drew, when so laden, sometimes 14 feet, sometimes 14½. 14½ was her outside.

163. But she had to get over Hebburn Shoal, I presume, at high tide?—Of course we required water over it, or the ship could not navigate it.

164. You could only get it at high tide?—At top high water; but you must take this also with you, that at that time there was no such thing as steamboats known. Now we have nearly 200 steam tugs in the river, so that we can at this moment tow a ship from Shields to the shoalest part of the river at the exact point of high water, and I consider that tantamount to 6 to 12 inches of a ship sailing up.

165. Will you point out the channel along which you went with your ship? (*The same was pointed out.*) It was in that deep bight?—Yes; the deep water lay in the bight, as it generally does in most rivers.

166. Then the channel that you went along would be altered, if the plan of Mr. Rennie was acted upon?—Certainly, materially.

167. You say that the depth of water at the bar is of the greatest importance, and you have spoken about the relative importance to Shields and to Newcastle. Can you tell me whether vessels, which have within the last few years come up the Tyne, have been of less or of larger dimensions than those before? Has your attention been called to that?—Yes; I know nearly every ship that is accustomed to go up the Tyne.

168. What do you say, then?—I say that the Newcastle traders have increased in size.

169. They have to cross the bar in going up to Newcastle?—They have all to cross the bar before entering the harbour; but those traders so going up to Newcastle Quay, though larger in size, do not carry the whole of their cargoes from Newcastle, when loaded. They leave Newcastle Quay generally in ballast, and come down to South Shields and load. Therefore you might have a ship of double the size trading there in that way; for a ship in ballast and a ship loaded are two very different things.

170. But if, while the depth on the bar was kept sufficient, the channel of navigation throughout the whole course was deepened without at all effecting an injury to Shields, would it not be an advantage to Newcastle to allow those ships to go up?—Unquestionably. Wherever you can deepen the harbour, it must be an advantage to all parties.

171. I presume that the state of the tide at the bar and at Newcastle Quay is not the same at the same time?—No.

172. A ship leaving Newcastle will have to cross the bar later in the state of the tide, as a general rule, than the ships leaving Shields Harbour; they can take it earlier?—Yes.

173. If that be so, is it not more the interest of Newcastle to have a proper depth of water on the bar than at Shields?—No.

174. Is it not equally so, at all events?—No.

175. Why not? Do you understand my question?—Yes, I understand your question perfectly. In the first place, a ship going from Newcastle, as I have just now stated, does not load at Newcastle, she comes down to South Shields to load, consequently she has the very same opportunity of crossing the bar with a ship at Shields, because she is at Shields. For instance, the Newcastle traders, the vessels which I have alluded to, though increased considerably in size, load at Shields; they do not load at Newcastle.

176. But you have spoken of larger ships lately going up to Newcastle than before?—That is those very vessels, the traders.

177. Do you mean to say that those ships which you speak of do not load at Newcastle?—Yes, I do say so.

178. Assuming that these larger ships are loaded at Newcastle, and looking to the state of the tides, would it not be more to the interest of Newcastle to have a deep bar than of Shields?—There is only one way in which I can imagine that it would be more their interest than of the parties at Shields. If it were possible (which it is not) to make it of one uniform depth from Shields to Newcastle, then it would be more the interest of the parties furthest removed from the bar than of those near it; but then that is a thing which can never be.

179. You are not an engineer?—But I am quite engineer enough for that.

180. You are aware, however, that there are some engineers who think it may be?—No, I do not believe any engineer does.

181. I speak of an uniform depth to that on the bar, not all the way up; but I ask you the same as on the bar?—Do you mean to have the same depth of water up the river as is on the bar?

182. Yes?—No, I do not think that can ever be.

183. Can you tell me the difference now?—I should say the difference at present is between 24 feet on Shields bar, and 15 feet up the river.

184. Have you taken any soundings, or are you giving merely your own general opinion?—I know it from the ships themselves, and I have seen their water marks, and having navigated a ship myself. Besides the ship that I have navigated, I have had many other ships in the river.

185. What do you speak with the greatest confidence from—from navigating a ship yourself, or from the ships which you have seen?—I could speak with equal confidence from both, inasmuch as the captain of my ship, coming in here, would act upon my instructions; the very first inquiry I should make would be—What is your depth of water?

186. Is it not some 20 years, at least, since you navigated a ship?—It is more than that; it is 30 years since I navigated one myself.

187. Then you have no more recent experience as far as your own navigation is concerned?—I have just as much experience now, and more than I had then. The fact is, that owning 15 sail of ships, which I did at one time, and all of those ships coming occasionally into the harbour, I step aboard there, and I do navigate the ship up the river; therefore, although I have not navigated at sea, I have in the harbour, to a great extent.

188. Have you ever known the depth of water on the bar to be only 21 feet?—Yes.

189. Can you tell me whether last summer was not a dry summer?—I think it was.

190. You told my learned friend that you concurred in Mr. Rennie's and Mr. Rendel's Reports generally. I presume you qualify that by not being able to give an opinion upon engineering matters?—I qualify that statement in some measure. Though I am not able to give the opinion which an engineer ought to give, I think it is quite reasonable to suppose that after moving about this river for 50 or 60 years, I must have opinions on some points even superior to those of an engineer himself.

191. You say you think that the river should be treated as a whole, and the works commenced at the bar and worked upwards?—Yes.

192. Supposing the same effect was produced by beginning at the centre or the commencement of the river, would it not answer the same purpose?—Yes.

193. Are you not aware that there is a difference of opinion upon that point among engineers?—Really, engineering opinions vary so much that to say there is not a difference of opinion is saying too much, I think.

194. Do not you know that it is the opinion of engineers that one influence which might be brought to bear upon the bar, would be an increased energy of the tidal flow by improving the state of the channel higher up the river?—Very likely.

195. Then if that be so, would not it be one reason why they should not commence at the harbour?—Yes; if that be so that would be a reason.

196. Have you ever been up the Clyde?—Yes; I was in the Clyde when the first ship from India went up there.

197. Do you know whether they have begun to make their improvements there at Dumbarton and at Glasgow?—No; I cannot exactly say that, but I knew the Clyde when there was 6 or 7 feet water, and I knew it when the first East Indiaman went up there. I have had ships there myself.

198. You say that no money, as far as you know, has been expended, except at Newcastle?—No.

199. Up to what time do you say that no money was expended except at Newcastle? I think you were speaking of before 1850?—When I spoke of no money being expended, I think I stated between Whitehill Point and the bar; between Whitehill Point and the bar, I observed, that no money had ever been expended, that is, in the lower part of the river. I will not say between this time and the other time, but not in the memory of man; not one shilling has ever been expended there, with the exception which I make of removing a few of the stones within the bar.

200. I certainly took down your answer, that there has been no money expended except at Newcastle. I may have misunderstood you; but I now understand you, at all events,

J. Straker, Esq.

25th January 1855.

to say, that what you mean to state is, that no money was expended between Whitehill Point and Shields Harbour, the bar?—Yes.

201. There was money, I presume you are aware, expended in those Willington improvements which you have spoken of before 1850?—Yes; I am quite aware that in those groins and in all those things money was expended, but for what purpose? Not for the benefit of the river.

202. In your view of the case?—In my view of the case.

203. Since the present Commissioners have become Conservators of the river, has there been any money expended on Newcastle Quays?—They have expended money in dredging in front of Newcastle Quay; upon the quay itself they could not lay money out.

204. Has there been any money expended in improving or building new quays, or any work of that kind?—Just previously to the formation of the present Conservancy, the whole of Newcastle Quay was rebuilt; it was made new at the expense of the Conservancy, at a cost of 60,000*l.* or 70,000*l.*, and therefore there was hardly room to do anything to Newcastle Quay after that.

205. (*Mr. Webster.*) You mean at the expense of the river fund?—Yes.

206. (*Mr. Seymour.*) I do not see how that exactly answers my question; that is as regards works undertaken before the present Commission. I ask you whether the present Commissioners have expended any money at Newcastle?—It is not in my recollection that they have, excepting dredging in front of the quay.

207. I believe there is a great portion of work on the north shore not ye t finished, on the rubble wall at the quay?—There are private works there with which we have nothing to do; that is being done by private individuals.

208. I understood you to say that one of your reasons for objecting to full-tide walls was that the same object could be effected by half-tide walls?—Yes.

209. You assumed that the same object could be effected by half-tide walls, as your reason why there is no use in full-tide walls?—That was one of the reasons.

210. When you talk of the same object being effected by half-tide walls, do you take into your consideration the probable operation caused by these half-tide walls, first in the effect upon the channel, and afterwards in the increasing of the stuff which is filled in behind them?—I take all that into account, and I consider, as I have stated, that a half-tide wall answers all the purpose of directing the current of the river in the proper channel without depriving the lower part of the harbour of the benefit of the scour of the water behind it.

211. But you told my learned friend that the tendency, after making these half-tide walls, would be that they would fill up higher than the half-tide walls?—No. I said it would be a work of great time; but in time they would fill up, in my opinion, to the level of the top of the half-tide walls.

212. To the top of full tide?—No.

213. To the top of the half-tide wall?—Yes.

214. You would recommend that as a general rule, on the river?—I would recommend a half-tide wall; not the filling of it up.

215. In order to keep the level at the half-tide wall, would it not require dredging and sweeping machines, and other operations of that kind?—No.

216. Would not, in fact, the tendency be to get the elevation higher?—No; not higher.

217. Would not mud be accumulating?—Not higher than the top of the half-tide wall.

218. Would mud be accumulating so as to interfere?—To the top of the half-tide wall, and no higher.

219. Would the current be weaker or stronger?—Stronger. There is no current at the back of the walls; it would be an eddy, and the very action of that eddy would be for the silt and sediment of the river to deposit itself there, and, in time, to fill it up level with the top of the half-tide wall; that is my opinion.

220. You say the tendency is to cause a filling up and a silting up, until it comes to the level of the half-tide wall; if that be the tendency, can you tell me by what magic, or by what principle, it is, that the tendency stops short at the half-tide wall?—Yes. With every breeze of wind, there is a certain lipper acting over the top of the half-tide wall, which washes off the mud, and what accumulates one tide washes off the next; the very action of the steamers going up and down the river causes this, and you will see it washed down level with the top of that wall, and it will go no higher. If that were not so, where there is no half-tide wall, and no wall of any kind, how do you account, or how can it be accounted for, that the mud does not accumulate there? From the very same reason, go up the Thames, or any other river where steamers go, and you will see that the little lipper of water washes away the mud and bares the gravel as it has lain there for some years.

221. I understand you to say, that you have no objection to filling up what you call the encroachments on the river with dredgings from the river, provided it is not done with ballast from London?—Yes. I have an objection, to a certain extent, even to that; but I say that would be much the lesser evil, and as it is absolutely necessary that we must have a deposit for the material dredged out of the river, I say I never should have raised an objection to it being deposited there, provided it had been properly done.

222. You never would have objected, provided the space was filled up with the materials got from the dredging, and provided it was not done with the ballast from London?—Yes; because every ton taken out from the river gives you a ton of water in its place; and, therefore, I consider that we should risk nothing by the amount of deposits which we made.

223. I presume that the frontage of the river becomes an important interest to the landowners?—It does, unquestionably.

224. What would become of their frontage, supposing you had this suggestion of half-tide walls carried out?—Perhaps, as an instance, you will allow me to refer to one case, which will explain the whole matter. We will take, for instance, Mr. Leslie's building-yard. Now, what I would propose, and what I did propose in the Commission, was this: instead of allowing Mr. Leslie to carry that red mark out to the half-tide wall, and to fill it up with ballast, which he was allowed to do, I said, make Mr. Leslie build his ship upon the land, not upon the river, or upon the land to be made in the river. And I said, let there be an opening in the half-tide wall for him to launch his ship through.

225. Would not the practicability of his taking your advice depend upon the state of the water?—He had all the water; they were only in the act of making the half-tide wall; therefore there was all the natural depth of water which Mr. Leslie had ever had, except as it was injured by that groin immediately above it, which certainly had silted it up in part, but otherwise there was the natural bank of the river for him to build upon.

226. Was not that in a shallow condition in Mr. Rennie's time?—We see by that map,—we will just take it in the state it was in,—I would ask, where the point of that stick is, what should have prevented Mr. Leslie, or any other gentleman, from building a ship, as I have always done, upon the land itself, and launching her into the river; and if ways were wanted to find deep water, let a passage be into the river.

227. How far across the river must he go in order to get three feet at low water?—The answer which I must give you to that question must be this: If Mr. Leslie, or any other gentleman, chooses to pitch upon a shoal part of the river upon which to build his ship (because he has come to it, it did not go to him) he must put up with the inconvenience.

228. Then it is a shoal part of the river?—No, I do not say that; it is just as you see it there.

229. Then a man who chooses to go there must put up with the inconvenience?—Certainly. It is no consideration of the conservators of the river how he is to find water to launch his ship into; that is his look-out before he chooses his yard.

230. But the inconvenience does not spring from the act of the landowner or from the act of the Conservators. Do you give that as an illustration, then, of the general effect along the river of the deprivation of the frontage from the landowners? You give that as the answer to the question which I put to you, as to what became of the frontage? You say that they must put up with the inconvenience?—Yes. I say there is plenty of deep water along the river where a ship may be built, without a man choosing shoal water for it.

231. Supposing, in place of it being made a half-tide wall, the full-tide principle had been carried out, what would be the state of the frontage then?—Do you mean the river frontage, or the part behind it?

232. I mean the river frontage?—The effect would have been, that he must have carried his ship-building operations close down to the full-tide wall; there would have been nothing else left for him, and he must have taken down so much of the frontage as to allow him to launch into the river. There is no other way in which he could have done it.

233. You spoke of the Tyne main shoal being a very hard material; was not it removed in 1832?—I have not the date.

234. About that time?—I cannot tell; I am not prepared with the date.

235. But it was removed?—It was removed. I mean to say it was removed by the dredger, and not by the aid of any river works.

236. You told us that the Hebburn jetties had been very mischievous?—I speak generally of all jetties—I do not speak of one in particular.

237. Can you tell me what has become of the Hebburn shoal?—The Hebburn shoal has been in a great measure removed, and it has caused another shoal lower down the river. Part of the shoal was removed very readily by the effect of the narrowing of the river there, and brought down to where this other red mark is, and there it deposited itself, and nearly made a bar across the river for a considerable time; that was the effect of that.

238. Do you know whether that is the place where they tried to find the shoal as the Commissioners went down the river the other day?—I do not know what you mean by trying to find the shoal. I cannot understand that.

239. However, the Hebburn shoal was removed?—Part of it was removed, and part of it remains there yet.

240. Was that after the jetties were put up?—Yes, and after it was dredged.

241. Is that Hebburn shoal shown on Rennie's map?—Yes.

242. You say that Mr. Brooks got the jetties lengthened after they had first been built to a certain extent, and then he got the dredger?—Yes.

243. And you attribute what was done to the dredging: was there any dredging before the jetties were put up?—I dare say there was.

244. In point of fact, were not there constant efforts made by dredging to remove the shoal at Hebburn before the jetties were erected by Mr. Brooks?—Not constantly.

245. Were there efforts made?—Yes.

J. Straker, Esq.

25th January 1855.

246. Were the efforts successful?—To a certain extent they were.

247. But whether successful or not, they did not remove the shoal?—They did not remove the shoal, and it is not removed yet. There is a shoal there yet. I said a part of it was removed.

248. Has it not been substantially removed?—No.

249. Has not the grievance been very much reduced?—No, I do not think it has; it has shifted a little further down.

250. I am not asking you of another place, I am asking you of the place where the Hebburn jetty is erected.—It is difficult to know what you mean by the commencement of a shoal and the end of it. If I knew exactly upon the map what you meant, I should be able to reply to it.

251. On Rennie's map you can see where the shoal was.—Which is the shoal that you allude to on that map?

(*Mr. Brooks pointed out the same.*)

(*Chairman.*) This is an important point, and you had better be quite clear about it. Be kind enough to come to the map and point it out yourself. Just show us where the sand existed which you called Hebburn sand.

(*The Witness pointed out the same.*)

252. What you are asked, and what I am anxious and the Commissioners are anxious to understand, is where the shoal was which you called Hebburn Shoal? it does not signify where it has gone to, but only tell us where it was in your opinion?—It lay here, in my opinion (*pointing out the same*), and continued more or less down here. Here, where this commences, is called the Cockcrow sand (*showing the same*). But it was a continued sand down here with the channel, lying in the direction which this points out.

253. Is it now, in your opinion, removed?—In my opinion a great portion of it is removed and carried further down the river.

254. (*Mr Seymour.*) Was not that a shoal on which the steamers used constantly to get aground?—Very frequently.

255. Have you ever stuck there yourself?—Yes, often enough.

256. How long have you been on it at a time?—I have been on it half an hour or an hour; so I have in other parts of the river. It was not the only place that we used to stick at.

257. Do you stick anywhere now?—I have been very little upon the river lately. Since we have got the railway I do not travel by the river much.

258. Have you been down the river at low water lately?—I was down the river very recently with the honourable Commissioners.

259. Did you pass near this place where you say the shoal has been removed to?—Yes.

260. How did your vessel get along there?—It was not low water, and it was not a spring tide. But to show that Mr. Brooks had considerable doubts about it, our own steamer, drawing 5 feet to 5½ feet water, which was ordered to convey us, he seemed to apprehend, would not have water down, and he ordered her off the duty, and got another with less water.

261. Did you not go down in the same steamer just at low water?—No.

262. Was not it very near low water?—No.

263. Some time previously? Did you ever go down at low water in the same steamer?—Not at dead low water.

264. Was it very nearly low water at the time?—Yes, very nearly low water.

265. Did you pass over the place where you say the shoal was removed to?—Yes.

266. Did you find an interruption?—No; but I beg to explain that merely going down the river in a steamer of five feet water, and talking of a river to navigate ships of the size that we have now, is perfectly ridiculous—it is trifling.

267. Is she of 5 feet 6 draught?—5 feet 6 inches; one party told me it was 5 feet, but Mr. Brooks told me 5 feet 6, and therefore I give him the credit of the half foot.

(*Chairman.*) It is not worth while to press this part of the examination further; it has very little bearing upon the real question which we are discussing.

Re-examined by Mr. Webster.

268. Do you remember a return being moved for of the quantity of dredging that had been done, which return was made by Mr. Brooks, dated the 10th of March 1853?—I recollect such a return being moved for, but I cannot speak to the particulars of it.

(*Mr. Webster.*) Perhaps Mr. Clayton will produce some copies for the Commissioners. We will consider this as put in, Sir. This is a return signed "W. A. Brooks, Guildhall, "Newcastle-on-Tyne, March 10th, 1853." "Received and ordered to be printed for the "use of the Commission." It relates to the quantity of dredging which had been done. It says, "On the 23d of October 1851, the dredging vessel was set to cut a passage "through the Walker Sand." Then it refers to 16th February 1852, it was then employed six weeks; 14,400 tons of sand were raised. It is headed "Hebburn Shoal."

(*Chairman.*) It is very likely we shall have the dredging master, so that probably, if you postpone that part of the examination, you will have the advantage of his examination.

(*Mr. Webster.*) I trust we shall rely upon documents which have been put in, Sir, created beforehand, so to speak, rather than upon evidence for the occasion.

269. (*To the Witness.*) When did Mr. Leslie come to this spot?—I have not the date.

270. Latterly, is it not?—It is so recently, that the place is not completed yet.

271. Assuming that what you say was the proper thing had been done, that is to say, a half-tide wall, and nothing put behind it excepting the dredging out of the river, would Mr. Leslie have been any worse for the purpose of ship-building, than if he had built his ships upon his own land?—No, certainly not.

272. Did you concur in the motion of Mr. Rayne, that no ballast should be deposited behind the groins, except chalk, and chalk rubbish, and ballast dredged from the river? Do you remember Mr. Rayne making a motion to that effect?—I do perfectly.

273. Do you happen to know what was the fate of that motion?—I think Mr. Rayne either withdrew the motion altogether, or altered it.

274. Although Mr. Rayne, who I believe is one of the gentlemen appointed by the Newcastle Corporation, gave notice of that motion, was it ever followed up?—No.

275. Or did any good come of it?—No.

276. I have asked you about when Mr. Leslie came to this spot. What part of the river answers to this description? "To be let on lease, for either long or short terms of "years, the lands forming the river frontage of Jarrow Grange and Hebburn Estates, "(on the south bank of the River Tyne,) extending westward from Messrs. Palmer's iron "ship-building works, to within a short distance of the Pelaw Main Staiths. This "property is well situated for iron ship-building, and for manufacturing purposes generally, "having a good depth of water in front, with a railway communication behind. Further "particulars may be obtained on application to Mr. Foster Whitehouse, or at 192, High "Street, Gateshead." Which appeared in a Newcastle paper of September 1853?—I have no difficulty in pointing out what it alludes to, because it begins at Jarrow, and goes up to Hebburn Quay.

277. Who is Mr. Foster?—I do not know.

278. Is he a land agent?—He is a land agent, I believe.

279. Do you know anything of Mr. Ellison or Mr. Leslie personally?—Yes.

280. They are represented, I believe, by either Mr. Clayton, or Mr. Philipson, are they not?—I am not aware.

281. You said that the money had been expended at Willington, but not for the benefit of the river?—Yes.

282. For whose benefit was that expended?—The benefit of the Corporation.

283. You also referred, or rather my learned friend did, to the liability which the conservancy had taken upon themselves, in respect of previous works?—Yes.

284. Do you know that that was part of the terms which you were obliged to concede to in the Tyne Act of 1850, which was put upon you by the Newcastle Corporation?—Yes.

(*Mr. Armstrong.*) That is, by the Act of Parliament?

(*Mr. Webster.*) Yes, Sir; but I asked him whether it was one of the conditions of the so-called compromise which they were obliged to consent to.

285. (*To the Witness.*) You were cognizant of all the circumstances which led to the passing of that Act?—Yes.

(*Mr. Armstrong.*) The Act of Parliament speaks for itself. That is so; they took it upon them.

(*Mr. Webster.*) I quite agree with you, Sir. It was my learned friend who introduced it; my learned friend puts this case:—Did not certain things take place whereby the Conservators were relieved from certain obligations, and the Corporation from others? And then, Sir, I say that all those arrangements were part of the compromise, so to speak, which my friend Mr. Clayton referred to.

(*Mr. Armstrong.*) You got the answer from this gentleman, that the present Conservancy had to pay for certain expenses which had been gone into by the other party, amounting to some 60,000*l.*; it appears that it was provided for in the very Act of Parliament constituting that body.

(*Mr. Webster.*) It goes further than that, Sir; it is a different question.

(*Mr. Armstrong.*) You are not going on with what can be at all material to our inquiry.

(*Mr. Webster.*) I will just state the fact, and there leave it. Of the 64th section, the marginal note is,—"If damages recovered against the Corporation by reason of works, &c.," which would include this very Willington Quay, "the Corporation may recover from the "Commissioners."

(*Mr. Armstrong.*) That is to say, the Commissioners took the place of the Corporation as conservators of the river for that purpose, and if anything which they had done before was found to be prejudicial to anybody, and they had to pay damages, they should be refunded to them by the persons who took all these liabilities upon themselves, when they took the office which had been before held by the Corporation.

(*Mr. Webster.*) Yes, Sir; but the Corporation retained the land which had all been made out of the river fund.

(*Mr. Armstrong.*) That is a question of law which we cannot decide at all.

286. (*Mr. Webster to the Witness.*) My learned friend has asked you a number of questions as to whether the works have been begun here or there; but, in whatever

J. Straker, Esq.

25th January 1855.

manner they are begun, ought they, in your opinion, to be part of a whole?—That I gave as my opinion.

287. Has anything like that system, namely, treating the river as a part of a whole, been followed at any time?—No.

288. You were asked several questions about the Hay Hole Docks; do you remember the inquiry before Mr. Walker? You were examined as a witness?—Yes.

289. Do you remember this statement being made by the Town Clerk? "The parties "shipping their coals in that bay, who are lessees of his Grace the Duke of Northumber- "land, had already begun to feel the prejudicial effects of that alteration in the channel of "the river which had been projected by Mr. Rennie; and the consequence was, the "introduction into the Bill of 1850 of a clause by which there is saved to his Grace the "Duke of Northumberland any right of his Grace, his heirs, successors, or assigns, to "prefer, commence, or prosecute any proceedings or claims which he or they may be advised "to prefer, commence, or prosecute in respect of the damage, if any, which may have "accrued, or which may hereafter accrue to his Grace, his heirs, successors, or assigns."—Yes.

290. "And then comes a clause which throws upon the new Conservators the burden "of the acts of the previous Conservators." Had that reference to those Willington Quays?—It had general reference to all acts.

291. But I allude to the passage where Mr. Clayton refers to the effects which had taken place at the spot. This is the evidence upon the Hay Hole Dock Bill. When Mr. Clayton refers to the consequences which rendered the docks at Hay Hole necessary, were those consequences, in your opinion, in reference to this very Willington Quay?—I thought that that was one of them.

292. (*Chairman.*) Do you think that the improvement of the river has been much retarded by the disputes and litigation which have taken place between Newcastle and Shields?—I think so.

293. Do you think that it is very desirable that these disputes should now cease?—I do.

294. Is it not very possible that by forgetting past differences a general plan might be arranged and steadily pursued by the Conservancy for the improvement of the river?—The trial which we have had hitherto goes to say No to that. I should be very happy if such could be done, if there was any superior power that we could refer to, that could settle any differences which might arise, but the experience which I have so far had goes to say that we cannot manage it. I am very sorry to come to that conclusion.

295. Are you aware that this Commission, in its Report, can merely suggest changes which must afterwards be carried through Parliament with probably much expense and opposition?—No; I am not aware of what the course will be exactly.

296. There can be no other course but that we suggest to Her Majesty, whose Commissioners we are, such and such changes, which changes must be in contravention of existing Acts of Parliament, and consequently must have to pass through both branches of the Legislature, and I leave you to reflect, by what has passed already, whether it is likely to be done without expense and without opposition?—Judging by the experience I have already had, my pocket says that it is a very expensive process, certainly.

297. Would it not, therefore, be much better to agree amongst yourselves, and avoid all these evils?—I quite agree in that, if we could agree among ourselves it would be much better.

298. Are you aware, that in consequence of the disputes which took place in the Mersey between Liverpool and Birkenhead, the Crown interfered, and that a Conservator of the Mersey is now appointed, who takes charge of the whole of that river without the interference of either Liverpool or Birkenhead. Should you prefer a similar course, a Royal Conservator?—I confess, I am sorry to say, that I should prefer it; if the old gentleman himself had the management of the river, in preference to what has been going on, I do not think it possible that we could be in a worse position than we have been in since I have known the Tyne.

299. (*Mr. Seymour, through the Chairman.*) Have we not agreed on the river line from Shields to Newcastle?—We have. I was one of the committee on those river lines. Mr. Rennie recommended a river line, and we agreed to that. I think that was after this Commission was appointed.

300. (*Mr. Webster, through the Chairman.*) Has such agreement of the committee, as to river lines, ever been brought before the Commissioners?—We agreed upon the river lines, but like most of our other agreements, where we agree it never produces any result. We have at this moment no such river lines laid down upon any plan that I am aware of. We agreed to the lines, but there it rests. Mr. Brooks was instructed to mark them down distinctly upon a plan, that we should have them to refer to, but to this moment, as far as I know, it has not been done.

301. (*Chairman.*) How long ago was it that Mr. Brooks received those instructions?—The 17th of August last.

(*Mr. Webster.*) Sir, my question was, whether the recommendations of that committee had ever been before the Commissioners. Perhaps you will have the kindness to ask whether this suggested agreement of the committee, as regards the river lines, has ever been brought before the Commissioners.

(*Chairman.*) What committee?

(*Mr. Webster.*) There is a practice as regards committees in this Commission which may have led to a great deal of the mischief which is complained of. It is suggested by the chairman of the Commissioners that a committee agreed upon river lines, and Mr. Straker says, that such was the fact. I now ask you, Sir, in order that there may be no mistake as to what the facts are, to put this question, whether such agreement, which it has been suggested had been come to by a committee, has ever been brought formally before the Commissioners, and anything done upon it.

302. (*Chairman to the Witness.*) You understand the question, be good enough to answer it?—I think it was not; I do not remember it; it never came before us as reported.

303. (*Captain Fitzroy.*) I am going to ask a question, a few questions, as to one or two matters of fact. Fifty years ago, when ships used to turn in and out, a portion of the distance in the Tyne, was the entrance, which is now called the Narrows, wider and easier for ships to get in and out than it is now?—It was wider.

304. Was it deeper?—I am not aware that it was deeper. I do not believe it was. There was always abundance of water to spare in the Narrows, and therefore the depth of water hardly ever called for our attention; it was so very much contracted that it was always deep at that entrance.

305. As it is now, if you were in a sailing ship, such a ship as would then have been in common use, could you turn in or out, or get in and out of the mouth of the harbour as easily as you could have done fifty years ago?—Not so easily.

306. On what account? what is the great difference?—On account of the less breadth which you have to turn in.

307. Has the In-sand grown up since that time, or was it in existence then?—It was in existence then, but did not extend so far down towards the mouth of the harbour as it has done since; but now since we have had a heavy fleet in the harbour, at this very moment the end of the sand has gone again; the In-sand is not so far down at this moment as it was some months ago, it was down nearly to the Narrows at one time; whether it is from the very large ships which we have lying at the lower part of the river or not I cannot tell, but it is removed partly of late.

308. When you refer to ships being no impediment to the passage of the water, but that on the contrary they act, as it has been called, as engineers—that they have the effect of scouring out the bottom, is it not the fact that they force the water, which must escape in some direction, to go in another direction, rather than through the place occupied by themselves?—Certainly.

309. The water which must escape, instead of going through where their hulls are lying, forces itself underneath, or goes to the opposite bank?—That is the effect.

310. The water would escape more freely if there were no ships lying there at all?—Certainly.

311. Is it not probable that the space called the Narrows is not so wide as it was, in consequence partly of the great impediment caused by the increased amount of shipping in the river, and of the fact, that the land floods and freshes, at particular times, do not come down with such violence as they used to do when the river was not so filled; that the fair-way for the water to escape, when ebbing from the inside, or when flowing in from the sea, is not so great as it used to be, and that the channel is not so free?—Such may be the case; it is a difficult point, upon which I should be cautious in giving an opinion what the exact cause may be. Of the fact I can speak confidently; but I do not like to speak where I do not see my way quite clearly.

312. In relation to the half-tide walls, is there not a fallacy connected with the principle of adopting half-tide walls, however good it may be? It is admitted that they will gradually silt up behind; that land will gradually be formed; is it not then simply deferring the evil to a future day? It is an encroachment upon tidal water?—Yes.

313. And a gradual encroachment, instead of giving the full effect of the whole wall upon the river? Supposing that a full-tide wall could be created at once, would the general channel of the river, the scour, and the flow and ebb of water, not be improved to a greater degree than by a half-tide wall? Would not the half-tide wall be doing that by halves which would be done entirely by a full-tide wall?—I think not. I have observed, that wherever you have carried out a half-tide wall, you generally have an eddy inside between it and the land, which answers the purpose, if I may use the term, of a mud trap; a sand trap, to collect the silt and sediment which is held in suspension by the tidal element; but the ebb and flow generally confines itself between the half-tide walls, and it has this advantage, that while it is so filling up, you have time and opportunity to dredge the channel of the river, and it gives you space, if you choose to use it, for depositing that; and if you do not so deposit it, it still contains a large quantity of that silt and sediment, held in suspension in the river, which falls at slack tide; it forms a receptacle for that, and relieves us of the expense of dredging that amount of material. And further, I have to say, that even after it has attained the height of the half-tide wall, it then only displaces half the amount of water; we still have the advantage of the other half, which you have not, if you make it full-tide.

314. You referred to ice coming down the river in large quantities?—Yes.

315. In 50 years, in your own recorded experience, in how many winters has ice come down in any great body, so as to be injurious to shipping?—I think in that time not above

J. Straker, Esq.

25th January 1855.

three times; twice I remember its being completely fast below the bridge right across. On one of those occasions they used sledges upon it, and had booths upon it, and various things below bridge. When it broke up, of course it was very dangerous to the ships down the river; but I only recollect two or three occasions in which it has occurred in 50 years.

316. Is there not a much greater formation of ice in a river where there are numerous inlets and wide places in which ice may form, than if the river were contracted to a uniform channel, with a considerable velocity of water alternately ebbing and flowing?—No, I think not; and for this reason, that those places which I alluded to are covered every tide with salt water, and I need not tell you that salt water does not freeze so readily as the fresh water. But up at Newcastle, there is a great portion of the tide time fresh water, and there it freezes more readily, and when it breaks up, then I consider that it is an advantage to have inlets for the floating ice to settle upon.

317. In removing Newcastle bridge, as has been proposed, should it not be a material consideration whether the ice formed above the present bridge will tend to injure the shipping lying in the river; should not some precaution be taken in that respect?—I have very little fear of that, for this reason, that I have generally found that, even as the bridge is now, with the narrow spaces between the arches, the floating ice finds its way down through it, and, therefore, if it were removed altogether, it would still only find its way.

318. But if the present bridge were removed, and a bridge with a very large span were substituted, the ice formed above bridge would then come down in great masses at times?—It would come down in larger masses, certainly; but it generally gets blocked up even before it reaches the bridge.

319. With reference to the half-tide walls, as you see them now in passing down the river between Newcastle and the Narrows, have the greater part of those, which you see at low water, been formed by private funds or by river funds?—By river funds.

320. The whole of them?—I believe the whole of them.

321. On both sides of the river?—On both sides of the river, both the full-tide and the half-tide walls.

322. All that has tended to contract the river to the proposed width has been done by river funds?—Yes, I think I am correct in saying that.

323. (*Mr. Brunel.*) You referred, in rather general terms, to your opinion of the works executed by the Commissioners having been almost injurious, or, at all events, not very effective. Will you have the goodness to point out specifically, without going into too much detail, the particular works which have been executed by the Commissioners, and which, in your opinion, have effected mischief?—I think the whole of the cross groins have effected mischief, for the reasons which I have before stated; that they have the effect of making solid land—that is one reason. Another is, that they impede the ebb and flow of the tide through that land, cause the water to rush out at right angles from those groins, and plough up the bed of the river into holes at the ends of the groins.

324. Will you have the goodness to point out one or two particular cases in which that effect has been produced; not a question of opinion?—I think the place where it has had the most effect is Hebburn Quay end; one or two of those goins there.

325. Above Hebburn Quay?—Yes.

326. Certain groins which you think are up the river above Hebburn Quay would give the most striking instance of the mischief?—I think so.

327. Are there any other of these groins which, in your opinion, have really produced a mischief, which could be ascertained now by sounding or by other means?—I believe that on looking at them you will find that behind every one of them the land has accumulated and grown up; it is one of the things which I object to as being injurious to the river.

328. It may be a question whether that is a mischief or not; I mean as to some positive injury, which everybody will admit to be an injury effected upon the navigable channel of the river by any one of these groins; will you have the goodness to point one or two which you think would be the best examples of that mischief?—I would take the one immediately above Mr. Leslie's yard; it caused such an accumulation of mud and silt that he applied to the Commissioners to be allowed to harden the bottom.

329. Mud and silt immediately below the groin?—Yes.

330. And within what would be the river line?—Yes.

331. What other effect at that spot has been produced by the groin?—I cannot point out any other effect than the general effect of stopping the ebb and flow of the water, and collecting mud and sand, and the growing up of land, which I fancy was really the intention of it. Perhaps Mr. Brooks will admit that the intention of putting those cross groins was to make solid land of it, which is one of the things I object to.

332. Up to the present moment, any positive effect of that groin which could be ascertained, as I understand you, is limited to the accumulation of materials above or below the groin, as the case may be, and within what we may call the river line?—Yes; and making the first commencement of land at the upper part, while this makes the commencement of it at the lower, and tends to make the whole into solid land, the thing which I object to.

333. I am speaking now of the effect produced up to the present time by the groin.—The effect has been that Mr. Leslie has come before the Commissioners.

334. Is there any other mischievous effect which you think has been produced by the groin?—No; I am not aware of any other effect. It forms an eddy generally at the

end of it; and, though I have not experienced it myself, I have heard complaints that a boat actually could not get landed, from the whirl which was on the end.

335. Are there any other works of the Commissioners of late years which you think have produced an injurious effect?—I alluded to Bill Point.

336. (*Mr. Clayton.*) That was not a work of the Commissioners; it was long before they came into office?—Yes, before the present Commission.

(*Mr. Brunel.*) How long before?

(*Mr. Clayton.*) Before 1850; in the year 1847.

337. (*Mr. Brunel.*) What is the specific mischief which, from your experience and knowledge of the river, you think has been produced at Bill Point?—Bill Point, as you will see, is a most acute angle.

338. I mean the mischief produced?—It has rather been, I should say, a perpetuating of the mischief which existed.

339. What is the particular effect which you think has been produced?—By running out those groins to the extreme of the point, it has perpetuated that which should have been removed, and which was recommended by all engineers.

340. Do you mean the throwing out of that wall which runs tolerably parallel to the course of the river just above Bill Point?—Yes.

341. And is that the only work at Bill Point which you think has been a mischievous work?—Yes.

342. You referred to ballast being thrown on the bank, or close to the bank, which you think washes into the river?—Yes.

343. Frequently passing down the river, can you point to any particular part where there is clear indication of the ballast being washed down in any quantity worth considering into the river?—Yes; to begin at the beginning, I should have to begin at Willington groin. I did not intend to have stated what I shall be obliged now to state, as you press me to it. That the commencement of that deposit of ballast was made without any quay or protection whatever; there was not the pretence of a quay to keep the ballast in which was thrown into the river there. There were a few piles put into the river out at the extreme point, a few planks were carried over them, a ballast engine was placed upon them, and ships lay alongside, and the ballast was taken out of the hold and transferred into the channel of the river without any protection whatever.

344. Was that at about what you may call the river line?—Yes, it was beyond Mr. Rennie's line then.

345. But it was what was I suppose at the moment intended for the river line?—It was perhaps what they intended as the river line then.

346. Was that projection which you speak of before the present conservancy?—Yes.

347. What year was that in?

(*Mr. Seymour.*) In 1836, Sir.

348. (*Mr. Brunel.*) Was it a part which was removed afterwards by the Commissioners?—The outer end of it was removed; it was thrown back to Mr. Rennie's line after that; then it continued; they continued to pour ballast into the river there till they reached the shore from that part, and after they had reached the shore a spring tide came, and the whole mass, many thousand tons, were carried away by the weight of the tide and spread over the river in all directions.

349. That, of course, we must put down at once as a great mistake. As to the practice of tipping the ballast, as a habit, and throwing the ballast on the bank of the river in such a position that it washed down into the river, where along the bank is there the strongest instance of it?—You may go a very little way above. For want of a proper quay the ballast has gone in not in one particular place, but in many places. The quays have been built up again with chalk or such material as they could get from the ships, and it has been filled up again. Of course in the course of a tide it disappears, and you cannot see it; you cannot go and look at it.

350. We will suppose for a moment that I wish to go down and see myself a strong instance of the case, where the ballast being so placed washes into the river, where would you take me if you wanted to convince me of that?—I should really require to go myself and look now, because every tide makes a great change in it. One spot where a good deal has gone in, is just at the foot of Willington gut; there has been material placed there which has been washed down the gut from the river over and over again, and at this moment there is a hard material laid there which probably will remain. I hope it will.

351. Is there any other place?—The same has taken place more or less wherever these chalk walls are; you might have observed it in going down the other day; you will see that the tide comes and washes away the ballast, for want of a proper quay in front to protect the material behind.

352. Is it the chalk ballast you invariably refer to as producing that?—The chalk or rubble is the material of which the quay is principally made.

353. Is it the chalk ballast to which you refer as being washed down?—Yes, and the material behind it is common ballast of all descriptions—sand and gravel, and all sorts of stuff; the front is generally made of chalk.

354. Then it is to the chalk that you refer principally as being washed down?—As being washed down and then letting the ballast wash out.

355. But there is no particular spot, excepting those two, which you have mentioned, which occurs to you at this moment to point out?—It has happened in various places.

J. Straker, Esq.

25th January 1855.

356. And there is no particular point except those two?—Yes, it was the case up at Walker; a good deal washed in there.

357. Do you think it is so at present?—No, I do not say at present; it has been. I have not seen it myself the last week or two. The fact is, that whatever washes out goes down into the river, and you see no more of it. Unless you catch it just after a heavy rain, or a high tide, which brings it out of course, you do not see it at all.

358 Is it at all times the practice to deposit ballast in this manner, or is it influenced at all by the difficulty of sending the ballast to sea?—It is influenced principally by the advantage it is to the parties who have land adjoining the river getting ballast deposited there, as a profit to themselves, and also the improved river frontage which they get, and the valuable land which is made. We do not send ballast to sea at present. Ships cast their ballast at sea, which is another great evil.

359. How long is it since you have sent ballast to sea?—We never did it. The ships cast their ballast before they come into the harbour; that is a very common affair; but we do not send it to sea.

360. I am desired to ask you whether the Willington staith is not planked on the west side up to the level of high water of spring tides, and whether that staith was not made before the Willington ballast quay was? First, whether the Willington staith is not planked up to the level of high water?—I cannot speak exactly to that; there are so many changes continually in those staiths that captains who are daily upon the river there cannot tell.

361. You do not know, you say?—I cannot speak positively to that.

362. But do you speak positively as to the ballast having washed in?—Yes, it cannot be denied; it is seen by every person passing up and down the river; it is a thing too notorious not to be seen.

363. You have rather implied that the ballast material is frequently deposited at certain places, either for the benefit of the Corporation who own the land, or for the benefit of individuals, upon which I do not ask any question; but do you apprehend that any practical harm has resulted from it, and where and when?—The harm resulting from it is, I consider, the displacing of tidal water, and making solid land; that is the great injury I consider—depriving the bar and the lower part of the river of the scour of that tidal water.

364. But has it happened to you that any practical result has been perceived which shows that your fear is well founded?—Yes.

365. There are great differences of opinion as to whether it does or does not do harm to a river to abstract that amount of tidal water?—As far as my observation goes, I think the lower part of the river, immediately above where the ships lie in Shields Harbour, has deteriorated; it has grown up.

366. To any great extent?—Yes, to a considerable extent.

367. Do you mean just above the tiers?—Above the tiers where the ships lie. The effect of the tiers is to keep it clear where they lie; so that it is quite plain the water must have an outlet either under their bottoms or alongside of them; and therefore though a ship takes the ground one tide, she is probably afloat the next by the scour.

368. Then you think a sensible effect has already been produced by the abstraction of the tidal waters in the Tyne?—Yes, that is my opinion.

369. Can you point out any case which you think will support your view other than the shoaling which you say has taken place just about Shields Harbour?—No, I am not aware of any other case.

370. That is the only one which occurs to you?—I think that is the only one.

371. And you think, if examined, it will be found that there is shoaler water all across the river there?—I think so; there is an accumulation of sand there above the tiers at North Shields, and the Narrows is contracted. I should hardly say that this is a thing which would have an immediate effect; it is a work of time; it is difficult to speak immediately after a work has been carried out.

372. You say that the works which have been executed have not formed part of a system. Can you assist me, if it is so, in coming to the same conclusion, by pointing out in what way they do or do not form part of a system?—I think wherever you run out works in any particular part of a river, especially if there is no obvious cause for it but the mere profit of the parties who have done it, there, I should say, they were acting upon that principle, and that, I say, was the case at Willington, because they went out at an acute angle there, forming an eddy below, injurious to the river, for no purpose that I know of but for the profit of the Corporation, in the first instance getting a profit upon the ballast, and in the next place getting the land when it was made. Of course, I am obliged to seek for a motive. I tell you what took place.

373. We will suppose for a moment that the parties allege (I do not know whether they do or not) that this was running out groins up to a river line at different places where it suited them; is that the case? Would it not form part of such a general system as that to make these various works, whether objectionable or not, or do they not form part of a system of running out groins to about the river line?—Yes; they would form part of that system.

374. Is there any contradiction apparent in those proceedings to the assumption that they form part of that system?—I am not aware that there is; but, as I stated before, my opinion is, that it should have been commenced at the mouth of the river, not in the middle or at the top of it.

J. Straker, Esq.

25th January 1855.

375. (*Mr. Webster through the Chairman.*) Are you aware, as a matter of fact, that waterworks have been done, and that the question whether such works did form any part of a system was the matter of considerable inquiry before both Captain Washington and the Parliamentary Committee?—Yes; I know that that was the subject of inquiry.

376. (*Mr. Brunel.*) What conclusion do you draw from that?—I consider that that part of the subject (the evidence went to the facts) was rather left to be inferred by the parties sitting upon the question.

(*Mr. Webster.*) My only object is to get at the facts. The great contention, both before Captain Washington and the Parliamentary Committee in 1849, was, that whatever works had been done were part of no system, neither of Mr. Rennie's system, nor of Mr. Brooks' system, but that they had been done, so to speak, haphazard, according to circumstances, and as dictated or influenced by the particular motives of the individuals who had the control.

(*Mr. Brunel.*) I am aware that that was the allegation. I take it for granted, though I do not know, that it was denied.

(*Mr. Clayton.*) It was distinctly denied.

377. (*Captain Fitzroy.*) Does the velocity of the flood tide generally, when flowing through the Narrows, appear to you to be greater or less now than it was fifty years ago?—I would say that I have not the means of ascertaining that myself. I tried to inform myself upon that subject, and, if you think proper, I will give you the information which I have got; but I cannot tell of my own knowledge, because I have never tried it. I should say it was less, but that is merely from observation.

378. If you have the means of furnishing the Commissioners with any practical data, which would enable them to form a comparison between the strength of the tide in the Narrows now and at any former time, it may be very useful, because we have the area, we have the sections, but we want the velocity rate at which the tide enters, and the rate at which the water ebbs out from time to time. Is the ebb tide stronger or less strong than when you were a boy, as far as you can remember?—As far as I can remember, it is not so strong. I gave you an instance of the ships driving through the Narrows with two anchors ahead, and such a thing has never occurred since, and I hope never will again.

379. The strength of the flood tide you cannot speak to?—I cannot speak positively, either to the one or to the other, of my own knowledge, for I never took the measure of it.

Mr. J. W. Lamb.

Mr. John Walker Lamb sworn.

Examined by Mr. Webster.

380. Do you reside at South Shields?—Yes.

381. How long have you resided there, and known the Tyne?—I was born in South Shields, and I am 50 years old; but I have not resided in it beyond a little more than 35 years.

382. You were one of the first Commissioners appointed under the Conservancy Act, I think?—I was.

383. You have now ceased to be a Commissioner, I think?—Yes.

384. Did you sign the letter to Sir James Graham, of the 3d of June?—I did.

385. I observe that one of the first paragraphs in that paper relates to the transference from the Corporation of Newcastle to the present Commission, and a question has been asked, as to whether the existing Commission has worked efficiently; what is your opinion upon that point?—I cannot say that it has worked, as I should say, efficiently.

386. Who is Mr. Robinson?—Mr. Robinson was the chairman of the South Shields Committee for promoting the Tyne Conservancy Bill, and is now one of the Commissioners under it.

387. (*Handing a paper to the Witness.*) Do you concur in the opinions expressed in that paper?—I do.

388. Just refer to the paragraph relating to the Commission.—Yes.

389. I observe it is stated there, that the Tyne Conservancy Bill proposes the introduction of Admiralty Commissioners, as a proper check and counterpoise to the partialities of the local Commissioners, but allows the Commissioners to elect their own chairman, and clerk, and treasurer. In your opinion, if that had been adopted instead of the present constitution, would things have worked much better?—I think they would.

(*Mr. Webster.*) I will hand this in, Sir; it was one of the papers issued in 1850 relating to this Bill.

390. (*To the Witness.*) Reference is next made in this letter to the alleged neglect and mismanagement of the river previous to 1850, and to the want of any general system of management. Has any general system of management been either acted upon or settled by the Commissioners since they came into office?—I never heard of any.

391. Have motions repeatedly been made from time to time to endeavour to get such a uniform and settled system?—

(*Mr. Seymour.*) They will be upon the Minutes.

(*Mr. Lamb.*) I will answer it, so as to give you the information. Motions have been repeatedly made to abandon the system of jetties and to adopt a system of training the

Mr. J. W. Lamb.

25th January 1855.

river by half-tide walls; those motions have been defeated. Then I should say, in further answer to that question, that no system of river lines has, up to the present time, been agreed upon by the Commissioners, or at least had not been so agreed upon at the time of signing this letter.

392. No system having been agreed upon, how have the works hitherto been carried on?—The works have been executed in a desultory way, sometimes a piece here, and sometimes a piece there; upon no uniform line as it is stated. I say that the Hay Hole Dock was not laid out either upon the line of Mr. Rennie or on any previously determined line; it was settled then, at the moment.

393. You refer here to the effect which has been produced by the quantity of tidal water that has been abstracted; are you of opinion that that has led, for instance, to the contraction of the Narrows which has been spoken to?—I should be slow to express my opinion that the works in the river have produced the contraction of the Narrows, but I believe it is an undoubted fact that the Narrows are contracted.

394. As regards the effect of the accumulation of ships in Shields Harbour, what is the effect of those upon the harbour?—My intercourse is a great deal with nautical persons, and from all quarters I have always heard that the accumulation of ships improves the depth of water, and does not at all deteriorate it.

395. And does it at all affect the quantity of water coming in from the sea?—Not that I should think; nothing that I ever heard of. I have a great deal of intercourse with ship-owners and others, whose interests are involved in these matters.

396. I believe you also signed the memorial of the 3d of August, did you not?—I think I did.

397. I ask you whether you concur in the statements which are contained there?—I signed it because I did concur in them; I should not have signed it if I had not.

Cross-examined by Mr. Seymour.

398. You say that the resolutions which have been brought forward, and the motions which have been made before the Commissioners, have generally been in regard to the disputed point of half-tide or full-tide walls?—These are not all the resolutions, but I refer to them.

399. You referred to those in illustration of what you meant as to there being no general system?—Yes.

400. When you say there is no general system of management, do you mean that there was a majority holding one view, and a minority another, as a general rule?—I do not even say that, because I do not think that the majority thoroughly committed themselves to the principle of groins, but rather staved the question off.

401. However, by want of system, you mean a difference of opinion as to carrying out the improvements of the river by half-tide or full-tide walls?—Yes; I should fancy it was from difference of opinion.

402. You alluded to the Hay Hole Dock as an illustration of there not being any settled plan. Do you know that the Admiralty, when an Act of Parliament is passing for docks, generally get a clause inserted with power to fix the line?—Yes; I believe that is the fact.

403. And do not you know that the line in this case was drawn and settled by the Admiralty?—I believe it was settled according to the recommendation of their Inspector.

404. So that if that is an illustration of a want of system, the Admiralty, at all events, are responsible so far as that is concerned?—So far as that individual question is concerned.

405. Are you a ship-owner?—No.

406. You are not an engineer, I presume?—No.

407. May I ask what you are?—I am a notary public and secretary to two or three Insurance Associations.

408. When did you retire from the office of Commissioner?—Last November.

409. Who succeeded you?—Mr. Mather.

Re-examined by Mr. Webster.

410. I do not understand you to say that there is any objection at all to the Admiralty settling the lines?—I have no objection; I think it is quite right.

411. Probably you would think it would be very right that the Admiralty should have the control of settling the lines which should be adopted throughout the river?—I say that I have no objection to their settling the whole lines.

412. Do you think that matters can ever go on harmoniously in this river so long as it is left to mere local control?—I think I adhere to the same opinions as were expressed in 1850.

413. (*Mr. Brunel.*) You state that no river line has ever been settled by the Commissioners; how long is it since this Commission was formed?—The Act was passed in 1850, and I think the first meeting of the Commission took place in November 1850. If I am wrong Mr. Clayton will correct me.

(*Mr. Clayton.*) You are quite right.

414. (*Mr. Brunel.*) Have you, or within your recollection has any other member of the Commission, attempted specifically to have a river line determined upon?—I believe that

Mr. J. W. Lamb.

25th January 1855.

for some time a Committee has existed called the River Lines Committee. I cannot undertake to say how long it has existed.

415. How long do you think?—Almost from the commencement of the Commission. Mr. Clayton will correct me if I am wrong.

(*Mr. Webster.*) It was on the 28th June 1852.

416. (*Mr. Brunel.*) A Committee is existing for the purpose of investigating that subject of the river lines?—Yes; called the River Lines Committee.

417. And they have made no report yet?—They had not at that time. I cannot say what has taken place since.

Commander W. Purdo, R.N.

Commander WILLIAM PURDO, R.N., sworn.

Examined by Mr. Webster.

418. You are a Commissioner of the Tyne?—Yes.

419. Were you one of the life Commissioners?—Yes.

420. Appointed and named in the Act?—Yes.

421. I think by his Grace the Duke of Northumberland?—His Grace the Duke of Northumberland wrote to me to know whether I would accept of it, and I agreed to it.

422. Have you since your appointment given considerable attention to the conservancy of the Tyne?—I have.

423. I believe you were the proposer of some of the first motions respecting the general management?—So far as regards a general outline of the river, as pursuing the general plan which Mr. Rennie had laid down, and which Mr. Rendel had brought before us in October 1851. I then commenced the principle, which I wished to be carried out, on the principles which they had laid down for us to steer by. That was particularly to maintain the tidal water.

424. Am I to understand you to say, that you suspended your motion, so to speak, with reference to this matter until after you had received Mr. Rendel's report?—I think so. I never attempted to take any liberties without first of all being quite aware of what these eminent engineers would suggest.

425. Did you understand that both those gentlemen concurred in recommending that the river should be treated according to some fixed system, which was settled and to be adhered to?—Quite so.

426. Upon the question of the encroachment of the tidal area, I believe you have made several motions?—That was the thing which most operated upon my mind. I took the principle as they laid it down, and as I have been accustomed to carry it in my public duties in other rivers.

427. You say according to the duties which you have been accustomed to perform in other rivers. Have you had experience in other rivers?—It was our general principle in the Medway and at Portsmouth, to allow no encroachment whatever upon the tidal area.

428. You are aware, probably, that it is stated in Mr. Rennie's Report, that, according the plan which he recommended, the number of acres which would be interfered with was about 440?—I do not know that from the plan; but I know it from the argument of the majority, that they intended to enclose land to that amount of acreage.

429. Let me call your attention to this paragraph in Mr. Rennie's Report:—"By the "line of jetties laid down by me, the surface of the channel, supposing the tide to be "confined within these points, will be reduced to about 896 acres, namely, 448 acres "less than it now is at high water."—Yes, it is so. I recollect it in his Report, and also his line.

430. Do you understand that, according to his recommendation, the channel was to be trained by half-tide walls?—Perfectly so. That the half-tide walls were to be joined to the ends of the jetties.

431. Have you concurred in the motions which have been made from time to time against the making of land by means of ballast, in the way which has gone on upon the sides of the Tyne?—I always opposed the making of land by means of ballast or otherwise.

432. That is, you never concurred in any of the motions for making land in that manner?—None.

433. We had complaints made as to the embankment of solid land at Willington Quay. Did that at all affect Hay Hole, or the subsequent operations of the Conservancy Commissioners with reference to it?—These embankments were made before I became a Commissioner, and when I became a Commissioner, there were some complaints made about the Hay Hole staith people, and that is all I know about them. I have no evidence to give on the point of these complaints, beyond that which I heard in our own commission, that there was a complaint about these groins being carried out beyond the line that Mr. Rennie had intended.

434. Did those complaints about the Hay Hole staiths contribute in any manner to the necessity for the Northumberland Dock?—I think, as to the reason why the dock should be made, that Mr. Rendel was the man who broached that subject, and proposed a half-tide dock; and on these grounds, a full-tide dock was generally agreed to by the Commission; because, I think it was generally inferred, that if the dock had not been projected, or a half-tide dock had not been projected, the evil would have become so bad, that the mischief would have continued to go on to the staiths below, and therefore the consequence was, that the Commissioners, I think very properly, agreed to make a dock in

Commander W. Purdo, R.N
25th January 1855.

some degree in accordance with Mr. Rendel's proposition. The only difference between them is between a half-tide and a full-tide dock. The dock users or dock managers can level the water in the dock to very nearly half-tide if they choose to use it so, or make it deep enough.

435. In your opinion, is there a very material difference between making dock works in the Tyne and creating solid land?—A very material difference.

436. Do you concur with Mr. Allhusen in his motion, that any solid land which is made out of the river funds should belong to the Commissioners, that the Commissioners should have full authority over the making of any solid land, and that any land so made should be the property of the Commissioners?—Certainly; the land so made, where the tide formerly flowed over, I think ought to be the property of the Commissioners.

437. I believe you have concurred in the motions which have been from time to time made, and I believe you originated some of them, as to prohibiting the deposit of ballast by private individuals between high and low water mark?—That was one of the first points to which I directed my attention, because I had been accustomed all my life to take all we could get out of a river, and put nothing in; and inasmuch as these two engineers (Messrs. Rennie and Rendel) had laid such emphasis on the maintenance of tidal water, I conceived it perfectly suicidal to put dredged material or imported ballast into the river, and make land of it.

438. Do you concur in the opinion expressed by Mr. Straker, that the general mode of dealing with the Tyne, should be by half-tide walls, and by placing behind them the materials which have been dredged out of the body of the river?—

(*Mr. Seymour.*) I will take the opinion of the Commissioners upon that question. My learned friend puts his question in a way which, in the ordinary analogy of a Court of Justice, is hardly correct, because, although the witness may be asked whether he has heard the evidence of another witness, my learned friend takes a long passage, and asks the witness if he concurs in it; he gives no reason.

(*Mr. Armstrong.*) He was going to give a reason; no doubt it is an irregular mode.

(*Mr. Webster.*) To a certain extent it is, Sir. I submit to the objection of my learned friend.

(*Mr. Armstrong.*) I do not think he was going to concur in it.

(*Mr. Webster.*) I will endeavour to be perfectly regular, Sir. The learned Recorder, I suppose, feels it his duty here in Newcastle to be very strict.

(*Chairman.*) We had better keep to the rules of evidence.

439. (*Mr. Webster.*) Did you hear the evidence given by Mr. Straker, as to his opinion that the proper mode of treating this river was by half-tide walls, and placing what was dredged out of it behind those walls?—I did. I concur with Mr. Straker's opinion, with this difference, that if I had the management of the river, I would put no cross jetties, nor would I deposit any material behind the walls. I would train the river with half-tide walls, or quarter-tide walls, rather; and I would let the river take its chance, because there would be very little displacement of water; the flow and ebb of the tide would not be obstructed in either way, and, in consequence, a greater volume of water would go up the river. Therefore, I consider that the cross jetties, which Mr. Rendel totally objected to in his report, have been the greatest possible evil ever since they were projected at all. If half-tide walls had been laid down on a proper line, and carried out with a proper angle, and curved with the rounding of the points, it would have been of the greatest possible benefit to the river, and it would have maintained the water; and the great object which I have had in view in economizing the tidal water has been for the purpose of maintaining the depth and width of the outer channel and over the bar.

440. As you have gone to the object which you have in maintaining this water, has your attention been called to the former state of the bar, and to the present state of the bar?—The bar has been a greater stranger to us than any part of the river, for we have known nothing about it. I have made various motions to get periodical reports on the fluctuation of the bar, but they have never yet been furnished; the fact is, we have nothing to furnish them with. It was but about two months ago that I made a motion to apply to the Trinity House, to be supplied with the soundings which the pilot took upon the bar, and that there should be attached to that the rise of the following tide. The Commissioners very readily agreed to that, and wrote an official letter to the Trinity House to be supplied with that document, and the only answer we got was referring us to their Tide Gauge, which is at the Low Lights, which only gives the rise of the tide. The diagram is taken off every 14 days, I believe, and it is a very erroneous matter; it has no connexion with the bar at all. My great object in endeavouring to obtain this return from the year 1840, was that I might get an annual average of the fluctuation of the bar, and the rise of the following tide, whenever they took it, which would guide us in the natural flow, and what we could depend upon in a general way. All this has been a stranger to us while we have been in the Commission. I do not know that we ever had one true sounding on the bar. I got once a paper, which our honourable Chairman gave me. I do not know the source which he got it from; but there were three parts in it that I totally objected to; the others might have been true, because they could have happened; but there were three which I totally denied being right. One gave 26 feet water, one gave 25½, and the other gave 25. Now I maintain that there never was, since we have been Commissioners, 25½ feet on the bar, or yet 26 feet, for, had it been so, the lower part of Shields would have been flooded. I will not say anything for the others; they were within the limits of what the tide might flow.

441. Was that return purporting to come from the Trinity House, do you know?—I do not know where it came from.

Commander W. Purdo, R.N.

25th January 1855

(*Mr. Webster.*) I may say, Sir, that you were kind enough to grant a summons yesterday for Mr. Pearson, who is the principal manager of pilots, I believe, for the purpose of his books. I do not know whether he is here.

(*Mr. Pearson.*) I am here, Sir.

(*Mr. Webster.*) Then, perhaps, if you produce your books and leave them with the Secretary, they may be referred to.

(*Mr. Armstrong.*) Was it merely for the purpose of producing the books.

(*Mr. Webster.*) Merely so, Sir.

(*Mr. Pearson.*) It is a memorandum book. It is a copy of my report to the Trinity House. I checked it off this morning; the Secretary thought I had better bring the memorandum book.

(*Mr. Webster.*) How many years does it go back?

(*Mr. Pearson.*) It is in the blue book on the Conservancy question up to 1850; my soundings are from this very book.

(*Mr. Webster.*) That will do.

(*Mr. Pearson.*) Then I can give it you from that time.

(*Chairman.*) We shall, very likely, want your evidence.

(*Mr. Pearson.*) I should be very much obliged to you, Mr. Chairman, if you could examine me to-day.

(*Chairman.*) Mr. Pearson had better swear to the accuracy of his book in some way or other.

(*Mr. Webster.*) He produces his books.

(*Mr. Seymour.*) What he has taken from the blue book I certainly should not dispute.

(*Mr. Armstrong.*) This is a copy which he has made himself from the book which belongs to him.

(*Mr. Seymour.*) I certainly should not object.

(*Mr. Pearson.*) This book of mine contains the soundings from 1848, from the time that they were taken on the spring tides, and they were given in my evidence on the Conservancy Inquiry in 1850. I only stated that, in order that it might give the Chairman and gentlemen less trouble in not going further back than 1850, and I have them from 1850 up to the present time.

(*Mr. Webster.*) What Inquiry do you mean, because there was no Conservancy Inquiry in 1850.

(*Mr. Pearson.*) Yes, there was.

442. Do you mean the one before Mr. Lawes and Mr. Abernethy?—Yes. This is a memorandum book; just a copy of the soundings.

(*Chairman.*) We will suspend Captain Purdo's evidence for two or three minutes, and put the pilot-master in the box, and just let him answer a few questions which are necessary to make the matter clear.

Mr. W. Pearson.

Mr. William Pearson, sworn.

443. (*Chairman.*) What book do you hold in your hand?—It is a private memorandum book of my own; a copy of the reports sent to the Trinity House of the soundings of Shields Bar at spring tides, at low water, and the rise of the following tide and the remarks on the bar are by what are called the Shields pilot's marks, whether better or worse.

444. To what period does that book extend?—The first taken was in 1848, and on the Conservancy Inquiry the soundings were given to 1850, and they are up to this present time.

445. All contained in that book?—Yes.

446. And you swear that to be correct?—To the best of my knowledge, errors excepted. I have checked it this morning down to 1850 by the Trinity House Reports.

447. To the best of your knowledge it is correct?—Yes.

(*Mr. Armstrong.*) You have got it down to the present time?—Yes; I have got it down to January the 20th; the sea was too high that day to sound the bar, but January the 5th we had soundings. The bar is sounded by two experienced pilots.

449. (*Chairman.*) Every day?—No; every spring tide.

450. Once a fortnight?—Once a fortnight.

(*Mr. Webster.*) Probably you will ask Mr. Pearson, Sir, whether there are not some records of a similar kind of an earlier date. I supposed that they had gone back for a long period

451. (*Chairman.*) How far back do they go at the Trinity House?—When I first went to Shields, which was in 1846, I took the soundings as they had been taken before me, and reported them once a month, without reference to spring or neap tides, and the Trinity House thought it would be much more accurate (indeed I recommended it), that we should take them each springs—that we should take them on the spring tide.

452. (*Captain Fitzroy.*) On which day do you take them?—We take them two days after the full and change of the moon; we consider that the best tide.

453. That would make four tides after the full or change?—Yes, the second day after; if it was on the 1st we should take it on the 3d.

(*Mr. Seymour.*) Would you ask him, Sir, whether they are taken by a gauge.

Mr. W. Pearson.

25th January 1855.

454. (*Chairman.*) How are they taken, by a gauge?—There cannot be any gauge upon the bar, it is impossible. I think the gauge would not have a very fair chance of standing. We have a properly marked pole, the men go down, and they take the greatest depth of water on the bar at low-water spring tides, and then we take the rise of the following flood tide. They have particular marks: it is old Prior's stone, covering twelve feet; that is their guide for watching the bar, whether it is better or worse, and they go down and sound for the best water on the bar, and then they look at the particular marks to see whether the bar has deepened or got shallower.

455. How many years have you been here?—I went there in January 1846.

456. That is nine years ago?—Yes.

457. From 1848, what is your opinion of the state of the bar? has it been better or worse since that time?—When I went down there, there was a vessel sunk upon the In-sand, the "Lady Faversham," and the bar was bad when I went down; but after her removal (she was blown up), it got gradually better, and now it is favourable; it is better this year than it has been, I think, perhaps, since I have been down, or quite as good, I would say.

458. (*Captain Fitzroy.*) What is the difference at low-water spring tide on the bar now and in 1848? how much water is there?—I took the average last night of the last four years, 1851, 1852, 1853, and 1854.

459. What is the difference?—I just summed it up last night after I got the summons. It reduces after 8 feet 4, down to 6 feet 10, I think.

460. (*Mr. Armstrong.*) Are any of those taken during the neap tides? when did you change?—Of course there were both neaps and springs intervening. I had to make a monthly report to the Trinity House.

461. These are all taken on spring tides?—Yes.

462. (*Mr. Brunel.*) Is there any memorandum made of the length of the bar?—No, the bar changes; it varies very much.

463. I see the position of the deep channel is mentioned, is it not?—Yes.

464. What is this memorandum?—The position of the lighthouses denotes the deepest water across the bar.

465. Are not these remarks meant to indicate the position?—Yes, they are; that is when I first went down.

466. (*Mr. Armstrong.*) Then the position of the channel of the bar, as well as the depth of it varies?—Yes, but the bar has been very straight lately.

467. (*Mr. Brunel.*) You do not keep any memorandum of the breadth?—No.

468. What is it now?—I do not know. Mr. Calver's soundings would give that best.

469. (*Captain Fitzroy.*) Then how came you to tell whether it varies?—It varies in depth.

470. But the breadth you do not know?—No.

471. What do you consider the greatest depth at spring tides on the bar now generally with a good tide?—The last time we sounded, we had 22 feet; that was January the 5th. On December the 21st, we had 21 feet 9, December the 6th, 22 feet.

472. At spring tide?—At spring tide. October 23d, 22 feet 8; October 7th, the sea was too high, and so on. Then September 23d, 20 feet 8; September 8th, 22 feet. Then August the 25th, the sea was too high again. We had 24 feet on March the 1st, and we had a 24 feet tide upon January the 30th. 24, I think, is about the highest that we ever had. I think it is only those two.

473. (*Chairman.*) What do you consider the average?—The average depth I made out last night, and I think it was pretty correct; I went over it: the average in 1851, at dead low water, was 6 feet 9¾ inches.

474. What at high water?—14 feet 4 inches rise of tide. In 1851, there was 21 feet 1¾ inches.

475. (*Mr. Armstrong.*) That is the average?—Yes. Then in 1852, 22 feet 8; in 1853, 21 7½; in 1854, 22 feet 2. That is the average throughout the year.

(*Mr. Seymour.*) It is suggested (perhaps the Chairman will put it) to ask at what part of the harbour he gets the rise of tide to add to the depth which he finds at low water.

476. (*Chairman.*) Will you answer that question?—The pilots have their own marks; we get it from the Coble Landing.

477. (*Captain Fitzroy.*) What means have you of measuring the rise there?—They have a post; it is marked upon this landing, I believe quite as correct, as it can possibly be.

478. Do you know that it is correct of your own knowledge?—I do not know of my own knowledge; they are experienced men, and they know that it is correct; there is no doubt of that; they take ships to sea by it.

479. You give these numbers as correct, to the best of your knowledge?—To the best of my knowledge.

480. But you have not verified their method of measuring the rise of the tide at all?—Not myself.

481. Then you depend upon hearsay?—No, I am dependent upon experienced pilots, not upon hearsay.

482. What they say?—Yes.

483. Then it is hearsay?—No.

484. You have not verified it by your own measurement?—There is no doubt their measurement is correct.

485. (*Mr. Brunel.*) Is this a post with the gauge plainly painted upon it?—No, it is a post on the side of the wall.

Mr. W. Pearson.

25th January 1855.

486. But has it feet marked on it?—There are no particular feet marked on it, but it is measured by the men themselves and marked by themselves.

487. (*Captain Fitzroy.*) Pilotage is charged by the draught, is it not?—Yes.

488. (*Mr. Brunel.*) You are a servant of the Trinity House, are not you?—Yes.

489. The Trinity House have a tide gauge at the Lighthouse, have they not?—Yes.

490. That is not used by you?—It is for the ships in the harbour and ships going down. The tide gauge is regulated for vessels going to sea, and it is regulated by my soundings. My orders from the Trinity House are simply these:—The bar is to be sounded at dead low-water spring tides, and I am to report to the light-keeper that sounding, and he regulates his tide gauge by the soundings, at least I suppose so.

491. (*Captain Fitzroy.*) The tide gauge is kept entirely independently of any other regulation whatever?—I do not know what the regulation may be, but I have to report to him.

(*Mr. Rayne.*) The tide gauge is taken from a measured level.

(*Mr. Seymour.*) Perhaps the Commissioners would be kind enough to allow Mr. Brooks to show where the Coble Landing is; it is on this side of the Narrows.

(*The same was pointed out by Mr. Brooks.*)

Commander W. Purdo, R.N.

Commander WILLIAM PURDO, R.N., further examined.

492. (*Mr. Webster.*) I was asking you about the information which you had been able to obtain respecting the state of the tides and the depth of water on the bar?—We never had any return of the depth; that was one reason why I wanted to get the annual average of the tide for a period of years from which we might draw some inference.

493. Did you get a return, or what purported to be a return, from the records at the Newcastle Trinity House prior to 1848?—I got no return at all.

494. Is there a Mr. Henderson, the keeper of the records of the Newcastle Trinity House?—I had a paper sent to me from a Mr. Henderson at a certain period; I forget whether 1851 or 1852, and I made some calculations from that, wherein it showed that the bar had deteriorated, and then I made a motion on that subject, in order that we should get some data to go by, but that data I never received.

495. What I want to get from you is this: there is an establishment at Newcastle called the Newcastle Trinity House, is there not?—Yes.

496. Is there a Mr. Henderson connected with it?—I am not aware of that.

(*Mr. Armstrong.*) Are they independent of the London Trinity House, or are they a branch of the Trinity House?

(*Mr. Webster.*) It is an independent body itself I understand, Sir.

497. (*To the Witness.*) Do you know whether Sunderland, Hartlepool, and several other ports are subordinate to this body which is called the Newcastle Trinity House?—I cannot speak of that of my own knowledge, but I can say from my friends, that they complain of being a creek of Newcastle.

498. The paper which you received, signed by a Mr. Henderson, was the subject of a motion before the Commissioners?—It was.

499. Did it relate to records of depths of water kept at the Trinity House prior to the 13th of March 1848?—It did.

500. Was that statement, so signed by Mr. Henderson, from the Newcastle Trinity House, brought forward at a meeting of the Commissioners?—I do not know; the paper was sent to me as being a Commissioner. I received the paper, and I conceived that this man was in the Trinity House; I have never seen the man.

501. Did you bring that paper before the Commissioners at a meeting on the 6th of January 1852?—I did.

502. Was that paper the subject of discussion?—It was.

503. Did it purport to show, from returns of 1841 as compared with the returns of 1848, the loss of water in seven years?—The only document I had to go by was the document itself, of which I think you have a copy there.

504. Upon the discussion which took place on that paper, showing such a loss in seven years, was a motion made by you for the purpose of obtaining accurate information?—There was.

505. And have you obtained it yet?—Not at all.

(*Mr. Armstrong.*) That is what he has said from the first, that he has endeavoured to get information upon the bar, and he has never got it, and this purports to be something which tells us really nothing at all.

(*Mr. Webster.*) It is a matter which was discussed.

(*Mr. Armstrong.*) He gives you some dates from which you may probably ascertain it.

(*Mr. Webster.*) It arises in this way: there is the Newcastle Trinity House, which is, to a certain extent, connected with the Newcastle Corporation ——

(*Mr. Seymour.*) The Corporation of Newcastle has nothing whatever to do with the Trinity House.

(*Mr. Webster.*) At all events, there are a great many individuals who are members of both bodies.

(*Chairman.*) I think you had better keep as far as you can from local squabbles.

Commander W. Purdo, R.N.

25th January 1855.

(*Mr. Webster.*) I am not going to enter into local squabbles. I am sure, Sir, whatever it may be, or whether material or not, I understand that a person cannot be a member of the Newcastle Trinity House without being a member of the Newcastle Corporation.

(*Mr. Clayton.*) Without being a freeman of the town.

(*Mr. Webster.*) You will have the means of getting at the information, Sir. I will ask you for a summons, if necessary. I presume that the Newcastle Trinity House does keep returns of a prior date of the kind which Mr. Pearson has just given you.

(*Mr. Seymour.*) It would save a great deal of time if my learned friend would summon the officer. I am sure the Commissioners would give him the power.

(*Mr. Armstrong.*) No doubt, if he will prove the fact that is wanted.

506. (*Chairman.*) Captain Purdo, as I understand him, complains that when these returns were applied for from the Trinity House, he did not receive them. Is not that it?—They sent to say that we could copy this return from their tide book at the Low Lighthouse.

507. (*Mr. Webster.*) I will go to another subject. At the same meeting, did you concur in a motion, that previously to the extension of the jetties at Hebburn Quay you should receive a series of soundings in the neighbourhood of Hebburn Shoal, the cross sections to be certain sections shown upon Mr. Rennie's and Mr. Calver's plans?—Yes; I did.

508. That being the 6th of January 1852, have the Commissioners ever received any such soundings?—None that I am aware of.

509. Were you a member of a committee, which, I presume, exists, called the River Line Committee?—Yes, at that time, and I believe I am yet.

510. Have the proceedings of that committee ever been brought before the Commissioners?—I never once was called to attend upon it.

511. You, though a member, were never called to attend upon it?—Never; I was never summoned to attend upon the River Line Committee.

512. So far as you know, have the Commissioners ever approved of any river lines?—No; not the full Commission.

513. Did you also take part in the discussions which took place upon the application of Messrs. Palmer, Brothers, and Messrs. Bowes and Company and Mr. Leslie, for licences affecting that extent of land at the bight near Hebburn Quay?—I did.

514. Did you object to the licence being granted?—I did.

515. Upon what ground?—Because I conceived it the first step to encroachment upon that line of the river.

516. Have there been any piles put in at any time?—There are twenty-two piles, which are standing there yet, driven by some miraculous means or other. The Commission went to view the line, but these piles were put, not at Palmer's place, but a little above it.

517. You say piles driven by some miraculous means. I presume you mean driven without the authority of the Commissioners?—They were: it is the red shade upon that plan. The dark shade is what Palmer was allowed, and the red shade is where the piles were driven, where Palmer carried his walls beyond the point which was allowed. This is the point which Mr. Brooks reported as being $5\frac{9}{10}$ths acres (*showing the same*). This is the part which Mr. Brooks reported to be $4\frac{3}{10}$ths acres (*showing the same*). The one was allowed by the majority of the Commission, and the other has not been allowed to this day.

518. (*Mr. Seymour.*) Will you point out where the piles were?—The piles reached from this point to that (*showing the same*); the wall is raised to within a few inches of full-tide level, which are precisely the words in the engineer's report.

510. (*Mr. Webster.*) This application was made, I think, prior to December 1853, was it not?' There was an application prior to December 1853?—I remember an application was made before that.

520. On the 8th December 1853, did you move for a return of the encroachments which had been made on the tidal area?—I did.

521. Did you obtain any such return?—Not at all.

522. Did you bring the subject before the Commissioners again on the 12th January 1854?—I think I did. I think I brought it before the Commissioners from time to time, from the 9th of December 1853, at each meeting for thirteen weeks. I do not exactly recollect the days.

523. Was the motion to this effect, "showing the number of acres of land that have been "abstracted, and are now under the operation of abstraction, from the tidal space, subse- "quent to the year 1840, on each side of the river between Bill and Whitehill Points, "including the space sanctioned by Parliament for the Northumberland Dock, and dis- "tinguishing that which is already land, from that which is under the operation of silting "and filling up?"—That was the motion.

524. I believe it was carried by six to five on the 8th of December, was it not?—It was.

525. You say you brought it before the Commissioners from time to time after that?—I did.

526. On the 23d of March was it disposed of by a counter motion?—It was.

527. Who moved it?—Mr. Rayne.

528. Who is Mr. Rayne?—One of the members of the Commission.

529. Is he a member of the Newcastle Trinity House?—He is.

530. On what grounds did he object to it?—I think, if I recollect the words rightly,

he said it was of no use to the Commissioners, and could be of no service, and moved that it be rejected. I think that is about the tenor of the words.

531. Did you also make a motion, with reference to the application of Messrs. Palmer and Company, that a return of the quantity of land which was applied for, or which would be affec te by the grant, should be given?—I did.

532. Do you remember when that motion was made?—No, I do not recollect the precise day.

533. How long was it before you obtained it?—I think it must have been very nearly eight or ten months.

(*Mr. Seymour.*) The motions will appear in the Minute Books, and I am ready to admit that Captain Purdo has been very zealous in making many motions.

(*Mr. Webster.*) I am not going into all the motions.

(*Chairman.*) It is better to take the material motions.

(*Mr. Webster.*) I can assure you, Sir, I went through the book yesterday, and read more in detail than might have been thought necessary, in order that my learned friend might know what I pointed to, and I proposed to ask the witnesses as they came up sufficient upon it.

534. (*To the Witness.*) Do you remember notices of motion to this effect having been circulated on the 5th of November 1853, in a circular signed "John Clayton, Clerk;" first, a notice of motion by Mr. Straker, "That Messrs. Palmer and Company having "raised the river wall at Jarrow to within a few inches of high-water mark, without "permission of the River Commissioners, the same be ordered to be lowered to the level "originally proposed by the Commissioners"?—Yes.

535. Did you concur in that?—I concurred in it.

536. Also, "That Messrs. John Bowes and Company, having commenced their new "staith at Jarrow, over tidal land under the jurisdiction of the Conservators of the river, "and having carried it as far as the chalk river wall, without any notice being given to the "Commissioners, and having asked their sanction only when the works projecting beyond "the river wall were about to be commenced, and the Commissioners having since sanctioned "these erections, the Commissioners would declare their decided disapprobation of the pro-"ceedings of Messrs. John Bowes and Company in this matter; and that, while they gave "their sanction to the staith, they did so in circumstances where a respect for their own "authority would have amply justified a refusal; and they abstained from such refusal "solely from an unwillingness to throw any obstacle in the way of additional facilities for "the shipment of coals within the port"?—I concurred in that.

537. What was the result of that motion, do you remember?—That motion was carried, and I think a letter was written to Mr. Bowes on the subject matter.

538. (*Mr. Armstrong.*) Then the substance of it was, that they concurred in it, but unwillingly?—Yes.

539. It was granted?—Yes.

540. They complained of the conduct of the person applying for it, but still they granted it?—Yes.

541. (*Mr. Webster.*) Was the matter of these piles to which you have referred also made the subject of a motion?—Not at all.

542. Did the Commissioners express their disapprobation of their having been inserted in the river?—The Commissioners came and viewed the place, and saw the piles there; but I cannot charge my memory with what they said upon the subject. But the piles are standing there to this day.

543. Have the Commissioners ever, directly or indirectly, given authority for the insertion of those piles?—None to my knowledge.

544. Do you remember a motion having been made for increasing the number and length of the jetties in the neighbourhood of Jarrow Quay?—I do.

545. Was that carried?—I think not. I think it was lost by a majority of one.

546. Were the jetties, nevertheless, increased in number and extent?—Yes, the jetties were increased.

547. Contrary to the express order of the Commissioners?—Contrary to that motion.

(*Mr. Seymour.*) Where?

548. (*Mr. Webster.*) Was it at Hebburn Quay?—Two new jetties were made at the lower part of Hebburn Quay, and two others on the same side in Bill Reach were lengthened.

(*Chairman.*) You had better point them out.

549. (*Mr. Webster.*) Just point out the two in number, and the others which are increased in length.—(*The same were pointed out.*) The upper ones were increased in length.

550. Where were the two that were increased in length?—I think they were the two upper ones.

551. By how much were those increased in length?—I think one was 100 feet, and the other about 70.

552. Was one of them a jetty, which Captain Washington had recommended being shortened?—I am not aware of that.

553. I believe the marks now upon the jetties show the distance to which they have gone—those posts?—I cannot speak to that.

554. Did you concur on the 8th of January, and the 27th of January, and on several other days, and on the 8th of December 1853, in motions for discontinuing the deposit of ballast between high and low water?—I have invariably objected to the ballast being landed between low and high water mark.

Commander W. Purdo, R.N.

5th January 1855.

555. Do you remember the engineer stating anything at anytime, as to the intention of the Corporation to make land?—I think in some of our discussions on the subject of the jetties and groins, I think on the 27th of January, and on the 8th of December, the engineer distinctly stated that it was his intention to make land along that shore, and that the Corporation of Newcastle (when Conservators of the river) had consented to make land along the south shore, in order to indemnify Mr. Brown for injury done to his works.

556. Do you remember a Report of Mr. Brooks in February 1853, respecting the quantity of water which there was, or the size of a vessel as regards depth which would go down the river?—I think Mr. Brooks made a Report in 1852, stating that between Dent's Hole and Shields there was no less than 17 feet water, that any ship of 17 feet water could navigate it, and that he shortly expected to make it up to 18.

557. Was that the fact?—The first time we had an opportunity of testing the fact was, I think, with the Sardinian frigate, because we had very few opportunities of testing these reports practically, and inasmuch as the frigate was launched some months after that (I do not know how long), she was wanted to go down, and they had to reduce her to 16 feet water; had the depth of water been as stated by the engineer, there would have been no occasion for us to spend 700*l.* in dredging before she could get down the river.

558. Were you led at anytime to make a motion requiring the engineer to present the Commissioners with plans and longitudinal sections, showing the depth of water in the river?—I first of all made a motion for sections from the bar upwards, but the engineer, I think, volunteered to give those sections to Newcastle.

559. Have the Commissioners ever received them?—No.

560. Have the Commissioners had any tide gauges erected?—There are three or four post marks in various parts of the river, but to what level or what standard I am quite at a loss to know, and that is one of the reasons why I had to complain of not knowing at any time what the water is.

561. Have you had any records of tidal observations returned to the Commissioners?—Not one that I recollect.

562. You have been, probably, as constant an attendant as anybody at the meetings of the Board of Commissioners?—I think I have.

563. In your opinion, has the Board worked efficiently?—I should say the very contrary.

564. From what you know of the various local interests, do you conceive it possible that a Board constituted only of local parties can work efficiently?—I think I have seen enough to show that it is hardly possible that a river which is managed by a pure local Conservancy, situated as the parties are on this river, can be worked for the good of the public, the good of the public in general, I mean.

Cross-examined by Mr. Seymour.

565. I presume you do not at all ascribe that result to such active interference as your own upon the subject?—I ascribe it to the parties. It is human nature that men generally look to themselves and to their localities; and when various points have arisen on this river the local party has generally started up and said "that will not do;" therefore, I should say that in such an extensive trade as is carried on in this river there ought to be some higher and more ruling power than the locality will afford.

566. You have spoken of bringing forward a motion some 13 times?—At our different meetings within the space of 13 weeks.

567. Did you upon each repetition of the motion believe that your chance was increased of carrying it, or was it to have a stronger record of your proceedings and opinions?—The answer which I received was so vague and unsatisfactory, that I saw very clearly there was no intention of giving it.

568. You saw that before each motion?—I saw it on each motion.

569. The course which you have generally pursued, with a view of engineering by improving this river, has been based upon the opinions of Mr. Rennie and Mr. Rendel?—I took the opinions of Mr. Rennie and Mr. Rendel as being the specific engineers who had been called in.

570. As a general principle, you consider any departure from their recommendation as suicidal?—Just so.

571. Do you consider Mr. Rennie and Mr. Rendel identical in their views of improving the river?—So far as the river line itself goes, I consider that their principles are perfectly reciprocal, but I do not carry it out to the bar.

572. But do you think, with regard to the question of jetties and encroachments upon the river and half-tide walls, that they agree upon those points?—With regard to the encroachments, they are perfectly agreed, with this difference: Mr. Rendel totally prohibits cross jetties, while the other admits them.

573. And you think that makes no difference in the principle?—It makes a very wide difference in the principle in favour of Mr. Rendel in my idea.

574. Mr. Rendel omits the jetties, but Mr. Rennie supplies them?—Yes; half-tide transverse jetties.

575. You have heard, I suppose, the opinion very often of your own engineer? Are you not aware that it is the opinion of Sir William Cubitt?——

(*Mr. Webster.*) I shall certainly object to that. I have no objection to your reading a passage from any report.

576. (*Mr. Seymour.*) Do you consider that as a matter of principle, not of detail or degree, there is any distinction between Mr. Brooks and Mr. Rennie upon the subject of

tidal walls and jetties?—Mr. Brooks advocates the full-tide jetty, and Mr. Rennie advocated the half-tide jetty; and Mr. Brooks, when he joined this Commission, had no intention of training walls whatever, Mr. Rennie had. That is the difference between the two.

577. You say you have frequently made motions with reference to returns as to the soundings of the bar. Has not the Chairman of the Commissioners supplied you several times with soundings of the harbour-master?— I have never but once that I recollect had any soundings supplied from the Chairman.

578. Have you applied more than once?—Yes. I think I made two motions on that subject, if not three. Now that it is called to my memory, I think I made three.

579. What were those motions for?—returns from the harbour-master or from the Trinity House?—From the harbour-master, I think, in one instance.

580. In that instance, did the Chairman consent to your having it?—I think not.

581. Did not the Chairman furnish it?—I told you just now that the Chairman furnished me with a set of soundings wherein there were 26 and 25 feet water given, which I totally repudiated, knowing that they were wrong.

582. Did you ever proceed to form an opinion yourself, or ascertain yourself the state of the soundings. Being a naval officer, I presume you would be able to ascertain it without even getting the information from the Trinity House?—Yes. I went with the pilots to see the method in which they did it, and I saw that it was correct and very well done, that they took the rise of water afterwards. If there are any men in the locality to give you a true report, it is the pilots, because the pilot is bred to it and his professional skill is employed. He may be called upon the next day to put his report to the practical test by taking a ship over, that is one reason why I called upon the Trinity House to give that paper.

583. You say that if there were 25 feet upon the bar, Shields would be overflowed?—I say if there were 26, a great number of the cellars would be full of water.

584. But supposing the bar was deepened and there were 26 feet, what do you then say?—But there could be no test that the bar was deepened. I knew very well at the time that the bar was not deepened.

585. How did you ascertain that?—I have it in my own book here; about that time it was 22 feet water upon the bar, and I took very good care to ascertain after that what the water was.

586. What date do you speak to?—I have not the exact date here; but the master of the pilots can give you the date, because I went to him and asked him the question.

587. I should like to know from you the date of the figures which you are going to give us?—I have not the figures here.

588. What are those entries, and who made them?—These are for former years.

589. I thought you said, when you spoke about the bar being in this condition, that you spoke from knowledge which you ascertained yourself?—I came over to Shields the very following spring tides, and I went to the harbour-master's office, and there I measured the tide, and I saw what it was, and ascertained what the water would be on the bar from the best experienced men in the place, and I saw very clearly that had it flowed 26 feet it would have flowed into the very rooms.

590. You complain of not being summoned to the River Lines Committee?—I have no recollection of receiving a summons.

591. Were you a member of the Committee?—I really do not think I am on the Committee now. I think that they put me off last year, and I am not really aware that I am on it at this time; but I do not recollect being called over from Sunderland to attend the River Lines Committee these two years.

592. Do you know about instructions being given to Mr. Brooks by the Committee to furnish a report to the Commission?—Yes.

593. When were those instructions given?—They have been given from time to time for several months.

594. Do you know that Mr. Brooks has been employed in preparing it?—Mr. Brooks, I think, two or three meetings ago, brought forward a paper to say that it was in progress, and that he was to bring it forward tinted, so as to show the parts which had been made into land within the line, the parts in progress, and the works intended there, tinted in different colours; but that has never made its appearance yet.

595. However, you know that he did proceed to carry that out?—I have not seen it yet.

596. You have spoken of these piles; were not these piles driven between two jetties at Hebburn?—These piles were driven between the staith that was put out.

597. Were not they driven to make a staith?—They had no connexion whatever with the staith. They were driven between the point that Mr. Palmer was allowed to carry his jetty to and the point that Mr. Bowes carried his jetty without having a licence for it.

598. Can you state what they were driven for?—I do not know what they (the piles) were driven for, but I understand they were driven by the Commissioners' pile-driver. Who sanctioned her employment on such unlicensed work I am at a loss to know.

599. But you do not know what the purpose was?—I do not know what the purpose was, or who gave them leave to get the Commissioners' pile-driver.

600. With regard to the two groins at Hebburn, you say there was a motion made to increase the number; did you agree to that motion?—No, certainly not.

601. Did you not agree to the extension of the groins?—There was a question. The Commissioners were very much impressed about these groins, and the water was very

Commander W. Purdo, R.N.

25th January 1855.

shoal; the engineer advised, and also some of the parties, that if they were tried they would be tried as an experiment. Now, the fact was, I consented to that as an experiment, though very reluctantly, and a report was to be made of their efficacy. That report has never been made yet. The groins are still there, and subsequently to that time the engineer has stated publicly that he intends to make land between those groins.

602. Have you ever gone with the engineer and sounded, and found the condition of the water there?—No; I do not live upon the spot, and I do not go with him. I only come here once a month, when I am called.

603. Only when you are summoned?—I come here when I am summoned, and when I want to know anything personally, I must come with my own boat, and my own hire, and my own man, to get all the information myself.

604. You come and attend the meeting, and go back, I presume, to Sunderland?—I do.

605. You do not very often examine the river?—I examine the state of things in it quite as often as any one.

606. Have you sounded?—I have seen Mr. Brooks sounding.

607. Did you ever see him sound there?—I saw Mr. Brooks sound the other day, but I put no faith in his soundings, because he cannot tell me any data.

608. However, as a Commissioner, you have gone with him, and you have not had recourse to any other soundings?—No, I have not.

609. Whether Mr. Brooks' data were correct or not, has he pointed out the condition upon the tide gauge? You have spoken of these posts; have you understood the system on which they were, or has Mr. Brooks ever promised to make you his pupil to comprehend it?—I do not understand the levels at all.

610. You say it is a miracle all through; has Mr. Brooks ever attempted to interpret the miracle, has he ever endeavoured to explain the meaning of these posts?—He has endeavoured to explain them to me, but not satisfactorily.

611. Has he not told you that the datum of the port is 15 feet, and that they were calculated upon that basis?—The datum of the port is 15 feet, but I do not know the datum of the port at Willington Quay, Howdon Reach, or Bill Point, because there is a different level.

612. Has not Mr. Brooks shown you that those gauges were set to Mr. Rennie's datum?—I have no recollection of his telling me that at all.

613. You say that Mr. Brooks' Report in 1852, when he said that there were 17 feet of water between the distances which you have given us was incorrect, on account of the frigate?—It might have been 17 feet water. I do not mean to say it was incorrect then.

614. What was the draught of the Sardinian frigate?—She was 16 feet.

615. Was not she more?—She was 16 feet.

616. 16 feet you have said?—I have; but some months afterwards the frigate went down, and if the water had remained as before, the ship would have gone down without dredging.

617. Do not you think, that with a ship drawing 16 feet, it would be a somewhat imprudent thing to leave her to the chance of merely a foot over?—Certainly not. I can take a vessel down this river within a few inches of the draught, and with a steam-boat, certainly.

618. She was a vessel worth about 60,000*l.*?—Yes; if it had been 600,000*l.* I should have taken her.

619. You have spoken of your experience. I believe you were originally connected with Sunderland Colliery?—I never was connected with the Sunderland Colliery, or with any other works in Sunderland.

620. After that, you became, I think, a sailing-master in the navy?—I did.

621. And then an inspector at Portsmouth?—I became master-attendant and Queen's harbour-master at Chatham, and then at Portsmouth, which duties I executed, for eleven years, to the satisfaction of my superiors.

622. And then you retired upon the pay of a commander?—I did. At Sheerness I was harbour-master, too, and at Chatham also.

623. A good deal has been said about the Jarrow Docks that are proposed to be erected; did you approve or not of the building of those docks?—I made that motion on the 8th of December, when an application was made for those docks to be made there; you will excuse me for answering it in that way. I considered that the abstractions had been so enormous from this river when that application was made, that it would not be either honest or just in us to admit of such an abstraction, or of such a dock being made there, which would occasion the silting up of the whole slake, before most seriously considering the consequence that would arise from the abstraction of such enormous quantities of water, which both Hay Hole Dock and all that south shore would abstract from the river, and, therefore, I considered that it was a duty of mine to endeavour to get that information before I gave my consent to anything being done in Jarrow Slake.

624. I suppose you still entertained that opinion, when you signed that letter to Sir James Graham?—I have no objection to docks in the river. I am a friend to docks in every way, but not out of the river.

625. Was one of your objects in writing that letter to Sir James Graham to prevent the completion of those docks?—Certainly not; but to get those docks put into such a shape that they would not occasion the abstraction of the slake from the river.

626. Did you oppose the principle on which the docks were proposed to be made?—I speak of abstraction from the river. I beg it to be understood, that I am as great a friend to docks as any man, in this river.

Commander W. Purdo, R.N.

25th January 1855.

627. Have you ever said that if you had got Mr. Rendel's tidal diagrams, Jarrow docks would never have been made?—I never said so.

628. However, you signed this paper, with the paragraph to which my learned friend has alluded? You are not a director, I think, of the Sunderland dock?—Not at all.

629. Have you ever used these words, "If I had got Mr. Rendel's tidal diagram, Jarrow docks never would have been made"?—I never said so.

630. Anything to that effect?—I never said that; but I will tell you what I have said. I have said that if that return had been given, the Committee of the House of Commons would have paused before they gave the Jarrow dock in the shape in which they have given it.

Re-examined by Mr. Webster.

631. There are, I believe, in the Appendix to Mr. Rendel's Report, very elaborate tidal diagrams?—There are.

632. Have the Commissioners ever made any use of those?—I never saw them but once, when I went into the engineer's room, and it is such a dark dog-hole that you cannot see them, and I wanted them very seriously, because I found that Mr. Harrison, the railroad engineer, had access to those things, and I wanted to make my own marks upon them. However, I got one or two of them. The fact is, there is no room to spread them out there; they cannot be dealt with.

633. Has that Appendix to Mr. Rendel's Report, and the diagrams referred to therein, as far as you know, been made no use of by the Commissioners?—I have never seen them referred to in any way that I know of.

634. My learned friend has asked you some questions about the Jarrow docks. Did you agree with the Admiralty in thinking that it was right, in reference to the economy of this estuary, that there should be compensation for the water abstracted?—I certainly agreed with the Admiralty so far; but I went far beyond that. I do not think the Admiralty went half far enough. With all due respect to the authority, I think that the Admiralty was most lenient to them in that view, because in 1847, when the docks were projected, Mr. Walker said that the engineer ought to take special care that excavations should be made for a compensation for the dock, which was only to take up, I believe, 60 or 70 acres, whereas now they will not accede to any compensation at all.

635. You said that at the time when you received the return from Mr. Cowen, which represented 25 or 26 feet water upon the bar, you rejected it, because you knew that the bar had not deepened?—I know very well, from the communication which I have had with the pilots, and with the people from whom I made it my business to ascertain how the bar was, that the bar has had very rarely more than 24 feet water since we have been in the Commission.

636. (*Captain Fitzroy.*) You remarked on Portsmouth harbour and the Medway; are not the circumstances of Portsmouth harbour in reference to the access or egress of tidal water very different to those of the Tyne, inasmuch as there is no river running into Portsmouth harbour?—There is no sediment running into Portsmouth harbour.

637. Portsmouth harbour is dependent for its existence upon tidal water only?—Quite so.

638. The Tyne is a mixture of a powerful river and a limited estuary?—Yes.

639. The estuary is comparatively small as compared with Portsmouth harbour?—It is so.

640. The Medway has only a very small river running into it, just enough to admit a common barge?—The Medway is an immense river; it carries line of battle ships up it.

641. I am not speaking of the salt water part, that I call the estuary; I mean above bridge it only admits small barges; the supply of fresh water coming down the Medway is very small?—It is.

642. Then the Medway is dependent almost entirely upon the tidal water for its existence. Are not the circumstances of the Medway entirely different from those of the Tyne, because there is no river bringing down any quantity of land water?—There is a good deal of land water coming down the Medway sometimes, because it was my duty to go and see that they kept the locks open three days after the full and change, to see that the land water did come down.

643. But you admit that there is a total difference between an estuary into which the sea flows, and from which the sea ebbs, which is dependent for its existence upon tidal water only, and an inlet into which a powerful river flows, which is dependent for its existence upon a combination of the land floods and the tidal water?—I admit that Portsmouth harbour is exactly the difference between the two; but this River Tyne, as you have just observed, is a mixture. I conceive that the River Tyne is kept open by the land water above Newcastle, but the tidal water is its main and principal support from Newcastle downwards, especially from Bill Point. Before the encroachments on this river, I conceive the estuary here was much larger that at Portsmouth.

644. Although you object to the exclusion of the tidal water, you concur with all the engineers in the principle of training the river and gradually making land on its banks? By every foot of land that you make on its banks by the building of half-tide walls, or by the deposit of any of the silt out of the body of the river on the sides, you must by so much diminish the tidal area? While you concur in the general principle upon which all the engineers have been going, you object strongly to excluding a single cubical foot of tidal water?—I so far object to it, that while I am training the river I know that I shall lose no quantity of water by cross jetties, and by those means I should be able to make my

Commander W. Purdo, R.N.

25th January 1855.

estuary or my channel of the river very much wider by retaining that water as a scouring power, which would be lost otherwise.

645. I only refer to the general principle, that while, on the one hand, you argue in favour of excluding tidal water by half-tide walls and by gradually embanking on each side, on the other hand you object to excluding tidal water at all; it is a contradiction in principle.—You must understand me that in the case of this river, we have a bar at its mouth, and we have a tide running at right angles to it, and the mouth of this river is between 400 and 500 feet wide. I conceive that the water is excluded to an extent that, when all that is in those places is made into land, I apprehend there will be a mischief arising at the bar which will become irremediable.

646. (*Mr. Brunel.*) You made some motions with the view of getting a return from the Trinity House, or from somebody, with respect to the soundings over the bar, I understand you?—I did.

647. And the answer was, that they could be had by sending for them?—That copies could be made. We could not have had the soundings upon the bar, because they did not take them; we could only have had copies from their diagrams of the rise and fall of the tides.

648. I thought you applied for a return of the tide on the bar?—It was refused. That is a copy of what we have got now.

649. Will it appear anywhere, do you think, in the proceedings of the Commission that it was refused. The answer, as I understand you, was that you might send down and get a copy at that tide gauge?—Yes.

(*Mr. Webster.*) The Low Lights Tide Gauge it is known as, Sir.

(*Mr. Brunel.*) There is a secretary, I presume, to the Commission.

(*Mr. Webster.*) There is only the clerk.

650. (*Mr. Brunel.*) Will it appear in the proceedings of the Commission that such an answer was sent?—Yes; there is a letter there.

651. You rather implied that you had sought for information from the engineer of the Commission occasionally, which you did not get?—We had no tidal reports at all from our engineer.

652. Is there any specific case which you can mention where you applied for information and could not get it?—I have no specific case where I made any straightforward official application, further than what I have done direct in the Commission, which I believe has been pretty well gone through now.

(*Mr. Webster.*) Perhaps you will have the kindness to ask for this letter, Sir. I understand that the letters are not entered on the minutes of the proceedings.

(*Mr. Seymour.*) When the Town Clerk comes back I will ask him as to it.

(*Chairman.*) We shall get it probably from the Chairman of the Conservancy Board, or in some other way. We will have it certainly.

(*Mr. Webster.*) Now that that matter has been mentioned, I should be glad if you would ask the Town Clerk to furnish at once, in order that we may have an opportunity of seeing it to-morrow morning, the correspondence with the Admiralty and with Mr. Walker relative to the piers.

(*Chairman, to Mr. Cowen.*) Will there be any objection on your part.

(*Mr. Cowen.*) Not the slightest, Sir; anything that we can furnish.

(*Chairman.*) You will be good enough to let us have it.

(*Mr. Cowen.*) Everything which you require.

(*Mr. Webster.*) It will be the correspondence with Mr. Clayton, Sir, as well.

(*Mr. Cowen.*) I would observe that the correspondence is still going on.

(*Chairman.*) You can only give us what you have got.

(*Mr. Cowen.*) If they will put on paper what they require, it shall be furnished.

(*Mr. Webster.*) The correspondence between the Commissioners and Mr. Walker and the Admiralty relating to the piers, and also the correspondence between Mr. Clayton and Mr. Walker and the Admiralty relating to the piers.

(*Mr. Brunel.*) Official correspondence?

(*Mr. Webster.*) There is a question whether it is official or not.

(*Mr. Armstrong.*) He cannot undertake to produce anything but the official correspondence.

(*Mr. Webster.*) The state of things, as it appears already by the report put in, is this, that there was a communication between Mr. Clayton and Mr. Walker and the Admiralty respecting Mr. Walker's appointment. It will appear as being referred to him. You will find that it was the subject of discussion at some of the meetings of the Commissioners, what had been the instructions given to Mr. Walker respecting the appointment of an engineer, and respecting the responsibility of those piers; and that those resolutions were passed, and were directed to be communicated to Mr. Walker, which were not communicated as resolutions, but Mr. Clayton stated that they had been communicated verbally. There has been a good deal of discussion upon it, and some motions have been made relating to the responsibilty of the appointment of an engineer, because Mr. Walker said that he would not undertake the responsibility.

(*Chairman.*) I think, in the present state of the piers, and their not having been finally commenced, we should be rather getting out of our record if we entered into an inquiry with respect to the correspondence which has taken place.

(*Mr. Webster.*) I am told, Sir, that the Admiralty have refused to allow the piers to proceed unless their conditions, which relate to the appointment of a resident engineer, are complied with.

(*Mr. Seymour.*) At all events, it appears that we should be getting into a very incohate discussion.

(*Chairman.*) I think we had better go on with the evidence; we can discuss that point to-morrow when Mr. Clayton is here.

(*Mr. Cowen.*) I should like to know how Mr. Webster knows all about it? I have only received the letter to-day, which I have shown to two or three persons.

(*Mr. Webster.*) I only know what I presume.

(*Chairman.*) Secrets go out.

Commander W. Purdo, R.N.

25th January 1855.

Mr. Matthew Poppelwell sworn.

Examined by Mr. Webster.

Mr. M. Poppelwell.

653. I think you are a Lloyd's surveyor?—I am.

654. Do you reside at North Shields?—Yes.

655. And you are one of the gentlemen who signed the letter to Sir James Graham, and the memorial also, I think?—I am.

656. From the minority of the Commissioners?—Yes.

657. How long have you known the Tyne?—Since I was a boy, say since the year 1802.

658. Probably your business takes you, or did take you a great deal up and down the Tyne?—The last twenty-one years, I have been invariably at work upon the Tyne.

659. With respect to the state of the bar and the Narrows now, as compared with what you remember it years ago, what is your opinion?—My general opinion of the bar is, that the port is rather shoaler than it was forty years ago.

660. Do you know about what has been called the breadth of the bar?—Not latterly. I have not sounded latterly; but thirty years ago I sounded regularly, and there was a very broad entrance then.

661. When you were in the habit of sounding there was a very broad entrance?—Yes.

662. In your opinion, is that entrance broader now or narrower than it was?—I have made no sounding myself. I should take Mr. Calver's soundings to be correct, and I should say the whole space of the bar has decreased in breadth from what it was, although the channel may be nearly as good as it was, within six or seven inches.

663. (*Captain Fitzroy.*) Do you mean the channel across the bar?—Yes; and the outlet.

664. (*Mr Webster.*) As regards that which is called the Narrows, what is their state now as compared with what it was thirty years ago?—I might go further back than that. The Narrows are much narrower than they were then. The sand shifts very much on the south side. One spring tide it is not the same breadth as the next tide. The sand is not left in the same position, but will be altered every raging tide. On the north side it is further south, and a hard foreshore is now formed; it was formerly very steep.

665. Then on the north side there has been an accretion?—Yes.

666. To what cause do you refer that accretion in the Narrows?—To material washed in by the flood, and the decrease of the ebb for getting it out again.

667. Then, in your opinion, is there less water going out and greater coming in than there was formerly?—I have no doubt that less flood comes in, which creates the weaker scour of the ebb.

668. Have you been acquainted with and watched from time to time the Willington Quay, and the way in which is has affected Hay Hole?—I have.

669. Were those staiths shoaled by the effect of that quay?—They had a tendency to shoal, and they have at this day.

670. With respect to the construction of those works and the works of Jarrow, did you concur in the opinion or the condition of the Admiralty that there should be some compensation provided for the water abstracted?—Do you mean the Jarrow Dock?

671. Yes.—Yes; it was my first opinion in the case of the Hay Hole Dock in the year 1850. I first mooted that question.

672. When your attention has been called to this subject of taking water from the tidal area, have you also been of opinion that compensation should be afforded?—That was always my opinion.

673. Upon what grounds was that?—To keep as much water as possible up the river as we could, or to increase if possible for scour.

674. There has been a good deal of discussion, and evidence has been given respecting the general state of the sailing channel up to Newcastle; what is your opinion upon that point, as regards the breadth of the channel?—I think the sailing channel in the river is better than it was. I think the track of the navigation is rather deeper than it was; but as a river worse.

675. But as regards width?—It is narrower.

676. Do you know what extent of material was taken out by dredging to let the Sardinian frigate down?—I believe the engineer gave information to our clerk, about 20,000 tons.

677. And do you know the cost of that to the Commissioners?—I believe about 600*l.* or 700*l.*

678. As regards the deposit of ballast, have you concurred in the motions which have been made to stop the deposit of ballast between high and low water mark?—In the year 1850, when we first met, application was made for a licence, and I declined voting in its favour in toto. I opposed it by all the words and all the means I could.

679. Was the licence given?—I believe the licence was granted.

680. What is the nature of those licences generally?—Licence is given, I believe, by

Mr. M. Poppelwell.

25th January 1855.

the Commissioners to the parties asking it, on certain conditions of their paying so much to the Commissioners out of the 1*s.* 4*d.* which they receive for the ballast.

681. Do you know what is paid to the Corporation?—It was 1*s.* or 10*d.* they wanted, I think; it is 8*d.* or 9*d.* they got. We get the 1*s.* 4*d.*, and pay them the 8*d.* or 9*d.*

682. Is the course of proceeding this, that you pay the Corporation of Newcastle and other landowners, or other persons who have a licence for depositing ballast, 8*d.* or 9*d.* or 10*d.* a ton?—Yes.

683. As regards the licence which the Corporation have, is that a matter of profit to the Corporation?—I presume it is.

684. Have you seen their accounts?—Not the Corporation's accounts.

685. Do you remember whether an objection was made to the payment which the Corporation sought to receive from the Commissioners with respect to this ballast?—At the time of granting the licence?

686. Yes.—I objected to it myself.

687. You objected to it entirely?—Yes, I objected to the rate.

688. On what grounds?—It struck me very forcibly that as the old Conservators of the Tyne had granted a licence to another gentleman, Mr. Mordue, at Wallsend, at the rate of 6*d.*, who was depositing ballast on the foreshore of the river joining the same place then asked for a deposit, that they should now come to the Commission and ask for 10*d.* a ton to another gentleman; it was not worth to them, as old Conservators, more than they would give to other persons.

689. You objected to the rate which the Corporation sought to receive from you on the ground that it was too high?—Yes.

690. Was the ground of that objection that the Corporation had themselves, when Conservators, granted a licence to another person at the rate of 6*d.*?—Yes.

691. Several questions had been asked about ballast that had gone into the river previous to 1850;—previous to that, are you aware of ballast having gone in?—I believe the evidence during the Conservancy question proved all that.

692. I think you took an active part in the Conservancy Bill, and were cognizant of the evidence given upon it?—Yes.

693. Does ballast still wash into the river?—Yes, in smaller quantities. I believe that the Commission upon that point has done some little good.

694. If the present state of things, as regards the ballast question, remains, is it a premium, so to speak, upon ballast being allowed to go into the river?—There is no question of it.

695. Will you explain how it operates as a premium?—If you put a ton of ballast into the river, of course the Corporation or any party else gets the money for that ballast so lost; but the Conservators have to dredge it out again, which costs them 7½*d.* a ton to take it back again; therefore we have so much more to pay for it.

696. If the ballast is not allowed to go into the river, for what purpose is it employed by those persons who get the money, in case of making land, for instance?—Of course they get land.

697. Persons who get a licence to deposit ballast, receiving a payment, use it for the purpose of making land?—Yes.

698. Can you give the Commissioners any idea of the quantity of land which has been so made out of ballast which is paid for by the Conservators?—I should think there would be 140 to 150 acres made now. I cannot be very correct upon that, but the engineer will know exactly.

699. Have you concurred in applying for returns as to the quantity of abstraction from the tidal area that has been made into solid land?—I have.

700. Have you ever received those returns yet?—No.

701. If you estimate the quantity of tidal area so made into solid land at 150 acres, what will be the value of it?—I should think 1,000*l.* an acre.

702. And has the whole of that been made out of ballast for which either the old Conservators or the present Commissioners have paid so much a ton for depositing it?—Decidedly, made by the river funds.

703. How does that affect the shipowners?—They pay it all.

704. Have you taken any part in the discussions as to adopting the system of carrying ballast out to sea in ballast hoppers?—I have. I have been in the Commission when the discussions have been going forward.

705. Have you approved of that?—I have.

706. Did you hear the evidence which Mr. Straker gave upon that point?—Yes. I agree with Mr. Straker's evidence; it is very distinct, and very clear.

707. You have very considerable experience in the river; is it the fact, that if you had a half-tide wall, the wash of the river would prevent the accumulation of the mud above the level of that half-tide wall?—Yes.

708. So that land would not grow up above the half-tide level?—No. When I say I quite agree with everything Mr. Straker says, I should like to qualify my views. I would deal with the whole river with training walls. There are large slakes in our river, such as Willington Slake, Wallsend Slake, which are marked on Rennie's chart, which contains about 140 acres of water. Those slakes I would have kept open; I would not have filled them up within the training walls; it is not discreet to fill them up at present, whatever it might be hereafter. At Wallsend we have lost the old deep channel north of the training wall; between this wall and the Cockcrow Sandbank the channel is at present

very narrow, but has as near the same depth as the old channel, but so very narrow it has become dangerous as a sailing track; the tide runs strong in such a narrow space; having lost the old north channel, the ships loading at the Wallsend staiths leave no room for navigable purposes. I would have loaded these ships within the training walls, in the old channel of the Wallsend Slake, then this narrow passage or channel would have been kept clear for the sailing or rather towing tracks of the river, which would have increased the safety of the navigable channel for vessels passing up and down, also keeping those slakes full of water, which would be by the influx of sea water every flood tide, it would increase the scouring power, and assist in that which is desirable to depress the bed of the river, and more effectually prevent the sand lodging as it now is in the Jarrow Reach. By the present system we are pursuing, we are reducing our power of scour, therefore, I should not have filled up within the whole lines, but proper narrow parts might be filled up with discretion, and the slakes that I mention might be kept open to assist the scour, and they would also have been beneficial to the shipping interests, merchants, and underwriters, as places of safe moorings and loading of the shipping, whilst it would not have decreased any value of the frontage of the landed proprietors, but would have had the tendency to enhance the whole of the river frontage space.

709. Did you understand Mr. Straker to say, that he would fill up the whole to the back of the half-tide walls, or only that they would fill up in some?—I understood him to say, that they would fill up in time; but I would keep them open.

710. However, do you concur in the opinion which Mr. Straker has expressed, that if there were only half-tide walls, the earth would not become deposited over and above them?—It would not.

711. Is that partly due to the wash, and partly to the operation of the steamers?—It is partly due to the condition of the river; without a steamer at all it would never fill up.

712. I asked you about the sailing channel. Do you know what is called Cockcrow Sand?—Yes.

713. Whereabouts is it?—Between the lower part of Hebburn and Wallsend.

714. Has Mr. Brooks put any of his jetties in the neighbourhood of it?—There are some jetties at Hebburn.

715. Notwithstanding those jetties, does Cockcrow Sand remain?—A very large portion of it.

716. What, in your opinion, is the operation of these transverse jetties, so far as regards the current?—My idea is, that they create eddies, and hills and holes all through the river, besides retarding the tide getting up and down; they stop the tide by the currents and the eddies. I have been in the centre of the river, between the stone groins on the opposite shore, and I have been whirled round like a whirlpool in a sculler, with a strong spring tide in the river, from the jetties on the side. From that effect, it has appeared to me that there must be holes in the bottom of the bed of the river. I think it retards the stream much, instead of accelerating it.

717. A good deal has been said of what has been done by dredging; in your opinion, what has been the effect by dredging in the Tyne?—Wherever it has been done it has had good effect.

718. And do you attribute the improved condition in which you say the channel is with regard to depth, to the dredging or to the jetties of Mr. Brooks?—Wherever the depth has been maintainable, it has been done by dredging. I have heard you speak to-day of Bill Point; three or four jetties were run out there from the north shore; when you came down to Bill Reach, jetties did run out from both shores, but now one shore is walled in; but the operation, according to my judgment, is this,—and I believe I can prove it to be the fact:—The jetty above Bill Point upon the ebb creates this whirl through the bed of the river towards Pelaw Staiths, and drops the deposit just below Pelaw; the jetties on the flood at Hebburn move the sand (which is a very bad shoal), from the effect of the whirpool, and drop it again just by Pelaw, and consequently 15,000 tons of sand had to be taken out at that spot. I believe that was just the operation of those two tides going in that manner.

719. So far as you can judge from what you have seen of the operation of the jetties, do you prefer the system of half-tide walls for the purpose of training the current?—Training walls, they would make an even bed, no doubt of it.

720. You have spoken of the evidence given upon the previous inquiries, the inquiry before Captain Washington and before Parliament. Do you remember whether it was one of the objections which were then urged, that the works which had been carried out had been carried out neither upon Rennie's line nor upon any other line which was produced?—I believe that was the case; our engineer carried out such line as he thought was best, I believe, at the time.

721. But did you then see, or have you since ever seen any system of river lines which were settled either by the Admiralty or by you as Commissioners?—I believe we never met upon the river lines till the 17th of August. I made a motion upon it then, that our Chairman allow Mr. Brooks to prepare river lines to give this very Commission information, and that resulted in a river line Committee meeting upon the 19th, and there we marked lines.

722. Have those lines been brought before the Commissioners?—Not yet; I asked for them at the last meeting, but I was put down by its being said that nothing was before the meeting, as we generally are when we want anything of that kind.

723. Have you also asked or been present when application has been made for information respecting the state of the piers and the communication upon the piers?—Yes, we have repeatedly asked for that.

Mr. M. Poppelwell.

25th January 1855.

724. Have you ever obtained it, or have you been put down in the same way?—There is not a clear understanding about the piers, but from time to time a motion has been made upon it and a resolution come to and acted upon. The first was, that Mr. Brooks should draw plans of the piers under the superintendence of Mr. Walker, and after a good deal of correspondence I believe with Mr. Walker and Mr. Brooks together (some time elapsed) that seemed to be undone, and then the Commissioners appointed Mr. Walker to be the first engineer, and to draw plans and to take the advice of Mr. Brooks when he thought proper. That seemed to fail, and we got back to the first plan again. Mr. Brooks draws the plans and Mr. Walker is to approve of them.

725. What was the understanding with the Admiralty upon the question of the superintendence of the piers?—My reading of the letter and instructions to Mr. Walker is clear that we are to hold Mr. Walker responsible, not for the drawing of the piers out, but that he was to be the responsible engineer for the piers.

(*Chairman.*) I think, as we agreed to postpone the discussion of the piers, this part of the evidence had better be taken at that time, if necessary, because we are now going into the whole history of the piers.

(*Mr. Webster.*) This is part of the evidence to show the necessity of these very documents being applied for.

(*Chairman.*) Go on.

726. (*Mr. Webster.*) So far as you, as a Commissioner, or the Commissioners as a body, were concerned, was the understanding come to in the resolution, that Mr. Walker was to have the sole responsibility of the piers?—I should have felt myself bound to take Mr. Walker, as not only drawing the piers, but finishing them.

727. Has Mr. Walker ever appointed a superintendent?—He has not.

728. Have there laterly been discussions at the meetings respecting the propriety of Mr. Brooks taking the superintendence of the piers?—Several.

729. Do you remember, in answer to the application which was made for the quantity of land to be furnished, whether it was alleged that Mr. Brooks was too occupied to do it?—I do not know; all I can say is, that there was very great unwillingness to give it.

730. Was it prior or subsequent to the circumstances which I have referred to, that it was proposed, I think by Mr. Rayne, that Mr. Brooks should undertake the responsibility or the management of the piers?—I cannot call that to mind, but I know it was proposed that Mr. Brooks should have it.

731. As the matter stands at present, so far as the Commissioners are concerned, does the responsibility rest, not with Mr. Walker, but with Mr. Brooks?—Mr. Walker is to be consulting engineer, I believe, yet.

732. I believe no great progress has been made with the piers?—No, from these causes, the engineers never understanding each other, that seems to have been the whole history.

733. And the Commissioners do not seem to have understood very well what the engineers were doing?—They do not.

734. Is that a part of the system of management which you have referred to in the letter to Sir James Graham?—I think it is, decidedly.

735. (*Mr. Seymour.*) That was part of your objection of want of system, at the time you wrote to Sir James Graham?—It was.

736. (*Mr. Webster.*) Since the new Commissioners have come into operation, have matters been conducted on a very different or pretty much the same system as they were in the old Conservancy?—I think the system on the river has gone on every way the same, with the exception, I believe, of not putting so much ballast into the river as we did before.

737. When I asked you about the channel, do you remember 20 years ago a ship called the Lady Jane coming up to Dent's Hole?—I do.

738. What water did she draw?—I did not measure her, but I was told she was 16 feet.

739. Do you remember the Cove?—Yes.

740. Who was the owner of that?—Captain Palmer.

741. Do you know how much she drew?—I believe 15 feet 9. I did not measure it. Mr. Palmer is in Newcastle.

(*Chairman.*) When was this?

(*Mr. Webster.*) Twenty years ago, Sir.

772. (*To the Witness.*) You knew the vessel 20 years ago?—Yes.

743. At all events, the Lady Jane and the Cove?—Yes.

744. Palmer was the Captain of the Cove.—Yes.

745. And was a person named Plummer the owner?—He was the owner of the Lady Jane.

746. On the 28th of July last do you remember a vessel grounding in the channel?—Yes; I had a letter from the owner upon that vessel, "Tranby."

747. Whereabouts did she ground?—At Hebburn Shoal.

748. (*Mr. Seymour.*) Did you see her?—I did not, but I saw the pilot. I have the owner's letter to me.

(*Mr. Seymour.*) It seems to me that this is not evidence at all.

(*Chairman.*) Mr. Poppelwell has already said that he considered the sailing channel from Shields to Newcastle improved, so that if upon that you make him say that vessels get aground, which I dare say they do every tide, it seems to me only making him contradict himself.

(*Mr. Webster.*) He says, Sir, that the channel is improved in depth but narrowed in width.

(*Mr. Poppelwell.*) We have it improved one spring tide, and the next very different.

749. (*Chairman.*) We have it already in evidence that you have said that in your opinion the sailing channel has improved from Shields to Newcastle?—I believe it has.

750. So that it is now quite unnecessary to go into evidence to contradict that, if you have any regard to your own evidence. How it will look when printed?—The sailing channel may be improved and the other parts of the river very bad, so bad as to loose nearly the scouring power, to the destruction of port and bar.

(*Chairman.*) We cannot admit that. You must go to something else.

(*Mr. Poppelwell.*) I will give evidence of my own ship if you please. I had a ship of my own that went up in the year 1827.

(*Chairman.*) You had better not go so far back.

(*Mr. Poppelwell.*) She came in from sea at 15 feet 6 in.; we lightened her, and she came up 14 feet water, and the other ship, "Tranby," last year only got up at 14 feet 2 in. after grounding. These vessels were nearly the same water in 1827 and 1854.

751. (*Mr. Brunel.*) Was it something remarkable that you took a note of it in 1827?—Not at all. I had a pilot; I had to pay 20 shillings to bring her up. We pay the pilots on the water the ship draws.

752. (*Mr. Webster.*) Was that your own ship?—Yes.

753. It is stated in Mr. Armstong's pamphlet, that in 1836 there was 14 feet or 14½ feet water at Newcastle Quay?—It might be so.

754. Did your vessel go up to Newcastle Quay?—Yes, and had the best berth.

755. You have given me some information about the quantity of land which has been taken from the river; do you know how much ballast, in 1853, was put between high and low water mark?—64,080 tons, I have it.

756. What quantity of dredged material?—90,934 tons.

757. (*Mr. Brunel.*) In the same time?—Yes; making a total of 155,014 tons put in. It struck me so forcibly that I wrote to the London surveyor for a return of what they took out the same time, and they took out 608,000 tons themselves that year.

758. (*Mr. Webster.*) Suppose that had been going on for 15 years, what would be the result?—We should have put in a million tons.

759. Within what period has the dredging gone on in the Tyne?—Since the first dredger was brought here in 1836 or 1837; one of the London spoon dredges. I will not be positive, but about that time. That was a bag dredger; a narrow bag.

760. That was the first dredger which you had in the Tyne?—Yes.

761. When did you get the steam dredger?—I cannot speak correctly to that.

762. Of later years there has been a good deal more dredging done, has there not?—A good deal. There is a very good steam dredger now.

763. What have been the additional dues that have been collected within the last three years in respect of pier dues?—I believe our pier dues are about 12,000*l.* a year.

(*Mr. Clayton.*) The accounts are before the Commissioners.

(*Mr. Webster.*) And the accounts show the different dues, do they?

(*Mr. Clayton.*) Yes.

764. (*Mr. Webster.*) If the river funds and the land made by them had been applied to river purposes, would it have been quite sufficient to have erected the piers?—Do you mean during some time back?

765. Yes.—I have no doubt that if the river funds had been applied to river purposes, according to my interpretation of river funds, the river would have been walled from end to end, and cleaned itself out. The piers are a costly thing to the shipowners.

766. Does the depth of water on the bar vary with the wind and the freshes?—It will.

767. Do you know to what extent?—Half a foot or a foot sometimes at different spots. That is the most, I should think, that it will do at any time. It does not do it very suddenly. It requires one wind three or four springs before it has that effect; but it will do so.

768. Have you endeavoured to ascertain what would be the quantity of acreage that would be left to the surface of the Tyne if what Mr. Brooks has represented from time to time regarding the operations should be carried out?—According to Mr. Brooks' evidence in the Commons or Lords, he intends to enclose Jarrow Slake, if I understand his evidence aright. I conceive the intention is to make from 750 to 800 acres of land from water space. Rennie's plan was to take 448 acres off for his half-tide walls, exclusive of the Jarrow Slake, which contains about 360 acres, thus leaving, by Rennie's plan, 1,250 acres of water at high water. Mr. Brooks' lines will leave about 800 to 890 acres; but his lines will speak for themselves.

769. I believe you have concurred in most of the motions which have been made from time to time at the meetings of the Commissioners for abandoning the system or transverse jetties between high and low water mark?—Yes; and all other matters connected with the cross jetties, as the only made land at the expense of the river funds, and no compensation to the public.

770. In your opinion, has the new Conservancy worked efficiently?—I do not think it has.

771. Do you think it expedient, having regard to the various conflicting local interests which there are, that there should be some controlling power, either in the Admiralty or otherwise?—It is very desirable.

Mr. M. Poppelwell.

25th January 1855.

Cross-examined by Mr. Seymour.

772. You have spoken to the bar being shoaler than it was some 40 years ago. That would be about the time, I presume, of Rennie's survey?—I am speaking of 30 or 40 years back. I cannot speak to the year exactly; but I have known the bar in my time vary from 6 to 8 feet.

773. Have you ever known it with only five upon it?—I think not, except once this year, there was 5 feet 10.

774. The Corporation get this 9*d.* or 10*d.* which has been spoken of as a consideration for allowing the deposit to be made upon their property, and providing machinery?—Machinery and labour; but I consider it is river property, and not theirs. It is the highway. We have come out 1,200 feet, or we are going to take 1,200 feet off from one part of the river.

775. Where?—At Wallsend. The river is 2,000 feet wide there, and, I believe, our engineer is going to leave 800 feet water space.

776. Does that land belong to the Corporation?—I believe it is Dean and Chapter property, but I believe the Corporation have some rights upon it. Whether they are tenants or have leases I do not know.

777. You sanctioned the making of a half-tide wall on the south shore?—Yes.

778. Did that 1,200 feet include the portion which you sanctioned?—Yes. We found the river in a certain state, and it is our duty as Commissioners to do the best we can to make the best highway. We are in duty bound to do the best we can for the public, and therefore, upon that ground, I sanctioned that half-tide wall; it did not meet my full approval.

779. You have spoken about the ballast; you say it falls now in less quantities than it used to do; is the ballast thrown, as a rule, behind the training walls?—It is.

780. With regard to dredging machinery, you say that wherever a depth has been obtained it has been done by the dredging?—Yes.

781. Did you know of the existence of Hebburn Shoal?—I did.

782. Do you remember when the jetties were put up?—I do.

783. Do you know that repeated attempts were made by dredging to get rid of that shoal before these jetties were erected?—Yes.

784. Were they successful?—They were not quite so successful as they were afterwards when the jetties were made. Allow me to qualify myself. It was not good work; it moved the sand from that immediate part and deposited it in another part of the river, which had to be lifted out by the dredger above and below the effect of the jetties.

785. Dredging brought to bear upon the shoal of the particular locality which I have spoken of did not succeed in getting rid of it, but when the jetties were put up with dredging, it did succeed?—Yes.

786. Have you had any trouble with it since?—We have had a very narrow channel there; the dry lands made since that period.

787. At what part of the channel?—Upon the south shore immediately connected with the jetties.

788. Has the land been between the jetties?—If I understand engineering at all, the engineer put that up on purpose to make the land. I am speaking without the training walls.

789. But the land since the erection of the jetties you have seen between?—Yes, without the training walls.

790. Do you know Bill Point?—I do.

791. Have there been any improvements effected there by Mr. Brooks?—The sailing passage of the river has been improved, and the berths of deep water have been taken away, thereby the shipping and merchants have lost a valuable part of the river.

792. You admit, however, that there has been an improvement?—In the sailing track as to sight.

793. Was it a dangerous place?—Bill Point is a dangerous place yet.

794. Was it not more dangerous before this improvement took place?—Yes.

795. Then it is less dangerous, and the sailing channel has been improved since the jetties were put up by Mr. Brooks?—In that immediate neighbourhood. The same sand bank went down to Pelaw Main, and there we lifted it by the dredger. It is dredging which does it. The jetties only take it to a certain distance; we still have to dredge it out.

796. However, the improvements seem to have been contemporaneous with the jetties?—I admit it is an improvement for sight.

797. Are you quite certain the dredger has ever been used there?—I am quite certain; not at Bill Point, but a little above Bill Point.

798. You say improvements have been effected in the sailing channel, and Bill Point made less dangerous. I ask you has there been any dredging at Bill Point?—There has been a straighter channel made.

799. But has dredging had anything to do with the improvement there?—Not there; we had to lift the sand up that went from that point, by dredging it out of other parts of the river; but we have lost the deep water berths for shipping. It is a sailing sight improvement, but not so deep a channel.

800. Is not the channel deep enough for all practicable navigable purposes?—It is deeper there than upon the other shoal parts.

801. Is it not deep enough for navigable purposes?—I should like to get it deeper; it is a sailing track improvement certainly.

802. Do you know the depth of water at low water there?—I should say 8 or 9 feet water at low water.

803. That would be about 19 feet, of course, at high water?—Yes.

804. You say that the dispute between Mr. Walker and Mr. Brooks as to the piers is partly the reason why you complained of the want of system in the operations of the Commissioners. At the time when that letter was written to Sir James Graham, had the sanction of the Admiralty been given to the piers?—Yes.

805. Are you sure of that?—Yes.

806. Had it been given to the working drawings?—No; I thought you meant the plans. I do not know that it is given yet.

807. I presume you are aware that Mr. Rennie recommended a south pier?—He did.

808. Do you think that his recommendation ought to have been carried out?—I think not.

809. Do you think that hat would have been an evil?—I think it would.

810. Would it, in your opinion, have had or not a very injurious effect upon the harbour of North Shields?—I think it would in windy weather.

811. Do you like Mr. Brooks' north pier better than Mr. Rennie's?—I do like both new piers which are now planned, if we only had the money to complete them.

Re-examined by Mr. Webster.

812. What is the extent of this land, which you say is about 1,200 feet deep, which the Corporation have of the Dean and Chapter?—The Corporation deposit ballast. I believe it commences at Willington Quay and goes up to Walker; about 140 or 135 acres. Something of that kind.

813. (*Mr. Brunel.*) Where is this?—(*The Witness pointed out the same.*) This is Willington Quay. I believe the Corporation property is there (*showing the same*). This is the part on which the Corporation are now depositing ballast, with, I presume, an understanding with the Dean and Chapter.

814. (*Mr. Webster.*) Have the Corporation commenced to deposit ballast upon that site which you estimate at about 135 acres?—Yes.

815. And have the Corporation received, with respect to the ballast which they have already deposited there, this 8*d.* or 9*d.* a ton?—Yes.

816. And if that same system is continued, out of what fund really will the land have been made?—Out of the river dues.

817. You have been asked several questions by my learned friend respecting these various alterations of the channel, and the effect of the dredging. Am I to understand you to say, that wherever these jetties have been carried out, if they have acted upon the bottom of the river or the sand, they have carried it into another place?—Into other parts of the river, and the dredger had to take it out.

818. Then do you adhere to the opinion which you have already expressed, that the substantial improvement of the river, such as it is, has been due to the dredger, and not to the jetties?—I do. If the dredger book is asked for, it will be clearly seen where the dredger has been applied.

819. Have you seen that return of Mr. Brooks on the dredging which has been printed?—I do not think I have, if the return is of late date.

820. (*Mr. Brunel.*) You mentioned that, in your opinion, during the thirty or forty years for which you had known it, the bar had become rather shallower?—I believe these last few months it has been fully as good as it has been for some time; but prior to that it was really shallower.

821. Then it is now as deep as you ever knew it?—I do not say that—I think I have known it eight feet.

822. Generally speaking, it varies one way or the other. I rather understood you, in your evidence in chief, that in your opinion the bar now, generally speaking, was less deep than it was in your early acquaintance with it?—The sailing track is now what one would generally call a fair bar—an average bar.

823. Do you think it has been deeper or not deeper, on the average of the last few years, than it was thirty years ago?—I believe during 1853 was the deepest, and it was a good bar, but not so good during the last year.

824. Do you think that, for the last few years, it has been as good or not as for a few years thirty years ago?—I cannot give an opinion upon that point except as to the sailing channel, which I think is much the same.

825. Do you wish at all to explain that with reference to your first answer? In the early part of your evidence in chief you stated, as I understood clearly, that the bar at present, from your own experience of it, was not so deep as it was in your early acquaintance with it?—It is not so deep as 8 feet just now; I believe it is now about 7 feet 6.

826. Should you say that, taking the last few years average, it is the same as a few years thirty years ago, or different?—I should not have been aware that the bar was even as it is just now if I had not heard the tables read over.

827. Your opinion, then, is founded simply, as we are very apt to found it, upon what is the general conversation, and not upon soundings?—It is by those who go to sea in certain tides.

Mr. M. Poppelwell.

25th January 1855.

828. And not from soundings?—No.

829. You stated another point as to which I wish to understand whether it is from your own knowledge or not, namely, that the groins caused hills and holes?—Of my own knowledge.

830. Can you point to particular groins, where you know, from soundings, that there are hills and holes formed from them?—I think that those groins protruding from Hebburn Quay, in the last few years have made a complete foreshore, which creates a hill.

831. That foreshore would be behind what is called the river line?—Yes; and part without the line.

832. In the channel between two river lines are hills and holes formed?—Yes. I go up and down, and I bump over them; therefore I have real knowledge of them. I am stopped sometimes five minutes upon them. On the 27th of July 1854 I went up with a steamer drawing 3 feet 6, and grounded twice in Bill Reach upon two hills there, and between them, as I went, I sounded, and found there was a hole.

833. In Bill reach you grounded upon a heap?—Yes.

834. A heap which had not been there before, I presume?—It was generally considered a good channel before.

835. By which groin did that appear to be caused?—By the protruding ones from the upper end of Hebburn Quay.

836. Is not Bill Reach a good bit above Hebburn Quay?—(*The Witness pointed out the position to which he referred.*)

837. Can you state at all opposite what point or shore the bank was, so as to identify it? Were you on board?—Yes.

838. Do you remember where you were?—Just above these jetties (*showing the same*).

839. Is that called Bill Reach?—Yes; it was half way up between Walker Staith and the Powder House.

840. You found a shoal?—Three or four.

841. At what time of tide was it?—I have a minute upon it; I think not quite low water.

842. How long ago was it?—The 27th of July 1854.

843. Are they there now, do you think?—I have it down here as a little above Walker Spout, above the two groins at Hebburn Quay, and not quite low water, the tide still ebbing; it says, when the boat gets on to one of those sands we scour away with the paddles and get over it.

844. What were you drawing?—Three feet six.

845. Then you were not in the channel, I suppose?—Yes, we were in the best channel.

846. Is there any other instance which you can mention as a groundwork for your general opinion that those groins form holes and hills?—I would mention the groins across from the quay where the new staiths are to Howdon, where there was only 4 feet 3 the other day. That sand is created by setting the sand loose from Hebburn Shoal; it is carried down, and from the top of the Cockcrow Sand it is also carrried down and below Jarrow. You gentlemen only went down the channel, you did not see the sand. I refer to the part below Jarrow Spout, where we crossed the other day. As I understood, Mr. Brooks said then that the tide was 2 feet above datum, if I recollect him rightly; I took a minute down at the moment.

847. Below Jarrow Spout, by what groin would that be caused?—By the upper groins sending the water down through the channel, and when it has lost its strength it falls.

848. Is it much below Jarrow Spout?—Yes, the tide will carry it down to where the deep water is till it finds a less tide, and then it drops immediately. The sounding is 6 feet 3, and 2 feet off makes only 4 feet 3 there.

849. You said that if what you conceived were the river funds had been properly applied, by this time great works would have been executed; what do you mean by the river funds?—I asked the learned gentleman some years back as to some 600,000*l.* or 560,000*l.* which was expended called river funds, but not upon the river. If that had been spent upon the river, I think there would have been a great improvement.

850. It is all gone, however?—Yes.

851. Do I rightly understand you that the ballast dredged from the river and deposited upon any of these grounds pays for the right of being so deposited?—No; I believe the Commissioners have agreements with the party who takes the ballast from us to allow us so much deposit room.

852. Did those 90,000 tons which were dredged and then deposited pay?—We had to pay for the whole of that.

853. Did the river dues pay for it?—Yes.

854. (*Mr. Clayton.*) For taking it up?—Yes.

(*Mr. Clayton.*) But not for the privilege of depositing it.

855. (*Mr. Brunel.*) We have heard a good deal of the Corporation or other parties paying for the right of depositing it upon the land?—If I understand rightly as to the ship ballast, it is just what you say, but as to dredged material, I understand that we have liberty of deposit at the back of the groins. When a party gets a licence he allows us a certain portion of that ground to lay the dredged material, and the Commission pays for it.

856. (*Mr. Clayton.*) For the taking it up, but not for the ground?—No; we pay for depositing the ballast, but not for the ground; we make that agreement with the party getting the licence.

Mr. M. Poppelwell.
25th January 1855.

857. (*Mr. Brunel.*) Then as far as the works of the river are concerned, you can dredge and deposit without paying anybody for the privilege of depositing it?—We do.

858. The only payment which we have heard of, namely, the 9*d.* or 10*d.*, which includes some labour, is with reference to the ballast from ships?—Foreign ballast.

859. But that does not affect the river dues, except so far as in your opinion its occupying some space which had better be kept as water?——

860. (*Mr. Webster.*) I think there is some little misunderstanding about the precise ballast question. If you will allow me I will ask a question upon it. A party pays to you as Conservators for a licence to deposit ballast?—Yes.

861. Those parties having previously received their ballast licences from the old Corporation before the new Conservancy?—No; it is only new ones.

862. Since the Act of 1850, a party who wants to deposit foreign ballast comes to you for a licence instead of going to the Corporation, as he would have done before the Conservancy Act?—He does.

863. Then as part of the terms of that licence, you reserve to yourselves the privilege of depositing (or you may do so, and have done so in certain instances,) the dredged material upon the land?—Yes.

864. But you agree to pay the party taking the licence, out of the Conservancy funds, a certain sum, say 10*d.*, for the foreign ballast?—Yes.

(*Mr. Brunel.*) For which you get paid, however?

(*Mr. Webster.*) No doubt, Sir.

(*Mr. Brunel.*) That is only a trading speculation between the party having the ballast and others; you are the intermediate agent.

(*Mr. Webster.*) Clearly, Sir, it is a question of the land being made out of the river funds.

(*Mr. Brunel.*) The river dues are not diminished by it.

(*Mr. Clayton.*) Dues are received on the ballast.

(*Mr. Webster.*) It will appear by the Corporation returns, by the accounts, that upon this very transaction with the Corporation the Corporation actually gets a profit of 800*l.* a year.

(*Mr. Poppelwell.*) If you sent this ballast to sea in hoppers, and if it could be delivered at sea for half the money paid for it upon the land, we should save half that money.

Adjourned till to-morrow, at 10 o'clock.

Friday, 26*th January* 1855.

JOSEPH STRAKER, Esquire, further examined.

J. Straker, Esq.
26th January 1855.

(*Mr. Straker.*) With your permission, Sir, I wish to explain more satisfactorily, I hope, than I was enabled to do yesterday, a question which was put to me in cross-examination, with respect to Hebburn Shoal. I was a little at a loss while I referred to the chart, not to find a place called Hebburn Shoal, but called by other names. What I wish to say upon that subject is this, that while I admit that the shoal, by whatever name you may call it, has been removed in a great measure, and that the effect generally, of contracting the river, both at that place and further up the river, and wherever the river has been contracted, has been to remove the sand, yet at that particular part, the groins which are immediately above it, and which Mr. Brooks, the engineer, stated, would be quite effectual of themselves to remove the shoal, were found not to have the effect of removing it, and that he was obliged to come to us for the aid of the dredger to assist in removing it, and that, therefore, the credit of the removal of that shoal is due to the united operation of the contraction of the river at that part and the dredger; that the part of the sand taken out of the river by the dredger has been effectually removed, either within the groins, or upon the land, in some place or other, but the part removed by the operation of the contraction of the river, or by the groins, has only been removed from that position further down the river. To that, I would wish to add another observation, which escaped me yesterday, to which, I think, a part of the deepening of the channel is due, and ought to be attributed; that is, to the continual action of the steamers going at low water up the channel of the river; the action of the paddles raises the mud and the sand, and tends also to clear the channel. I think something is due to that. And in connexion with that, I would just beg to remark, while I am here, that I think it may be taken partly as an illustration of what I set out with, that the river ought to be treated as a whole, and that the works should have been commenced at the mouth of the river, and my reason for that is, that if the contraction had taken place in the first place at the mouth of the river, instead of the upper part, the sand so removed would have passed out to sea, and we should have got quit of it entirely, instead of removing it, as we have been doing, in the upper parts of the river, and lodging it in the lower.

865. (*Mr. Seymour.*) You say that the part of the shoal which has been removed by the contraction is removed further down the river?—Yes.

J. Straker, Esq.

26th January 1855.

866. Can you point out upon that map the spot where the shoal is?—I will not say that I can point to the precise spot, but I can tell you generally where it is, quite sufficient, I dare say, for your question. (*The witness pointed out the same.*) I state most confidenitally, that a great part of the sand, not only from Hebburn Shoal, but all other sand which has been removed from the upper part of the river, has lodged itself from the lower part of Jarrow Quay, up to Willington Quay; that the whole of this space has been very materially and very injuriously shoaled, and we have had constant applications for the dredger, not only to clear those berths, but at this very moment the dredger is employed to clear away a part of that sand which is marked red, off some of the works here.

867. (*Chairman.*) Do not you think that that is a perfectly natural thing to happen, that when you have dislodged a great shoal higher up the river, the heavy part of the sand would naturally endeavour to deposit again down below, and that there must be another process to get it out?—I quite agree with that; therefore, I recommend that we should begin at the lower end of the river, and then the sand so displaced would have passed out to sea.

868. (*Mr. Seymour.*) You speak confidently, you say?—Yes.

869. Do you speak with confidence merely from opinion, or from actual testing?—From passing down the river, and taking a view of the river very recently, and from seeing that we have had numerous applications, more than we could supply, for the dredger to clear away the sand which has been so deposited, and seeing the dredger in operation, and knowing from the parties, for instance, our worthy Chairman, for one, has stated over and over again, that if he did not get the dredger his works must be laid in altogether.

870. Would you be surprised if you found deep water now where you point out?—I should not be at all surprised if we found deep water where we have the dredger employed, because she makes deep water.

871. All across?—Yes. I should be very much surprised if there was not shoal water across here in various directions.

872. (*Chairman.*) In short, you think the shoal still exists?—Yes.

873. (*Mr. Webster.*) By what name is it now called?—Jarrow Sand is the name, which extends all the way up.

874. (*Mr. Seymour.*) You said something about the steamers. I need scarcely ask you, have the steamers been in operation before as well as since that sand has been dislodged?—We began with one or two steamers, and we then commenced increasing them, and as we have increased the number of steamers, their operation upon the sands must have been increased.

875. I merely ask you whether steam-tugs were not going up just as much before this sand was removed?—To what date do you allude?

876. I allude to 1849, 1850, 1851, and 1852.—What I mean to imply by my observation is, that ever since steamers have traversed this river they have had an effect, to a certain extent, in deepening the channel.

877. Do you mean to say, generally, that they have an effect in deepening the channel, or that they had an effect upon Hebburn Shoal?—I say, generally, they have had that effect.

878. Did they ever produce, in your opinion, any effect upon Hebburn Shoal?—I will not pretend to say any particular part of the river that they have affected one more than another. I am speaking of the general effect of a steamer.

879. (*Mr. Webster.*) As a means of keeping the river open?—Yes. But if you want an illustration of that, I will tell you of an operation that was tried, before I was a River Commissioner, in the time of the old Corporation. They actually employed a dredger to raise the sand up and to drop it down again, that it should be carried away out of the river; that is something much upon the same system.

880. (*Mr. Brunel.*) You were a Commissioner in 1850, when the new Commission was appointed?—Yes; I was appointed upon the new Commission.

881. Are you still a Commissioner?—I am.

882. From that time to the present, as the different works have been undertaken on the river, have they been in some manner brought before the attention of the Commissioners, and ordered, one after the other, before they were executed?—Some of them have, and some of them have not.

883. Do you mean that works of any magnitude have been executed on the river without being ordered?—There have been works executed upon the river that the Commissioners knew nothing of.

884. What sort of works?—For instance, the piling in front of Palmer's Quay.

885. What you mentioned before?—Yes.

886. Any others?—The raising of the half-tide walls there was done without the knowledge of the Commissioners.

887. Any others?—I cannot charge my memory, at this moment, with anything else.

888. With those exceptions, or a few others, have the works generally, which have been carried on upon the river, been in due course brought before the Commissioners by their engineers or their advisers, and ordered by them?—Generally they have.

889. With respect to not proceeding with any system, to what facts do you refer which would explain that, dropping the idea whether it ought to have begun at the bottom of the river or above, or anything of that sort?—I think one of the great objections which myself

J. Straker, Esq.

26th January 1855.

and other Commissioners have to the system is, that we have no ascertained river line upon which we are to work.

890. When these different works have been brought before the Commissioners, has any plan been laid before the Commissioners showing the proposed works?—In many cases we have not had plans. At a certain stage of our proceedings, resolutions were proposed by Mr. Robinson, one of the Commissioners, and were agreed to, that in future nothing should be undertaken upon the river without a regular plan being laid before us.

891. How long ago was that? a long time ago?—I think it was Mr. Robinson who proposed it. Am I correct, Mr. Robinson, in that?

(*Mr. Robinson.*) I either proposed or seconded it.

(*Mr. Webster.*) Mr. Stevenson will be called, Sir, and he will prove the date.

892. (*Mr. Brunel, to Mr. Straker.*) To what do you refer more especially when you say that no system has been followed?—Mainly what I have stated, that there has been no ascertained or determined river line to which we should go out, and upon which we should carry the works.

893. That is the principal thing?—That is the principal thing.

894. Have you any reason (and show what reason if you have) for supposing that the works have been commenced at one place or at another without reference to the improvement of the river, but with reference to any other object?—Yes; I think I stated in the former part of my examination the reason, namely, that parties had a profitable interest in the matter, such as the Corporation, who had a large river frontage.

(*Mr. Clayton.*) You are speaking of a former time.

895. (*Mr. Brunel.*) Since 1850, I think we had better talk of. I gathered as you were about to repeat that in a former part of your evidence, you implied that the works were commenced at different places without much reference to the improvement of the river, but rather with reference to other objects not immediately connected with the improvement of the river, and I wanted to know whether it is your impression that such has taken place since 1850, and then for you to point out the cases?—I can point out one case, which is a case which has been already alluded to, that is, Mr. Leslie's case. It was never intended by the Commissioners that that was to be made into solid land in the way it was, and it was only when I accompanied you down the river a few days ago, that we ascertained that it was actually rising up to high-water-mark. I say without any permission of the Commissioners.

896. That is one case?—That is one case.

897. Is there any other during the four years which we are talking of that occurs to you?—My memory does not serve me at this moment, I think, with another case. Yes, I now remember another case, which is the case of the late Mr. Crawhall.

898. Where is it?—That was a place opposite his land, above the bridge. I know nothing of the grant which he got before our time. I quite admit that Mr. Cowen stated to us,—and we do not doubt that he had permission from the Corporation, he was one of that body, and was the mayor at one time,—that he got some permission to enclose land above bridge, opposite to his ground there; but it was objected very frequently after we became Commissioners that it was not properly protected. We instructed our engineer to look to it, to see that it should be protected by proper posts and planking, which was the method in which he was proceeding to make this embankment, and on the first view, which I accompanied up the river, we found that this river work, which was to embank that part of it, consisted of a parcel of pit props, as we call them, and a parcel of inch and a half slabs, and that those pit props and inch and a half slabs had given way, as they were sure to do, and the mass had forced its way into the river in several parts; in fact, the great bulk of it had gone right into the river. That is another instance.

899. Was any work executed there by the Commissioners?—No.

900. Is that, as I am to understand you, a case of neglect which the Commissioners and their officers were guilty of?—Yes.

901. With the exception of the two cases which you have mentioned, the successive stages of the works which the Commissioners have undertaken have not been influenced apparently by any object except that of the improvement of the river? However, those are the cases which you would mention as exceptions?—Those are the cases which immediately present themselves to my recollection.

Captain William Linskill.

Captain WILLIAM LINSKILL, sworn.

Examined by Mr. Webster.

902. I BELIEVE you reside at North Shields, in the Borough of Tynemouth?—I do.

903. And are the owner of property there?—Yes.

904. Are you also a Justice of the Peace for the County?—I am.

905. How many years have you known North Shields?—I spent the first years of my life there until I went into her Majesty's service; and after 14 years' service in infantry and cavalry, I retired, and came back to reside here in the year 1846; on the death of my father, since 1846, up to the present time, I have been a constant resident.

Captain William Linskill.

26th January 1855.

906. Was that about the time when the Shipowners' Committee and some of those other questions were being agitated?—I came back here a short time before the agitation commenced, and it was not of my own accord that I entered into it.

907. From that time to the present have you taken a very active part in the proceedings with reference to the Tyne and the interests of Shields, as you conceive?—I have so.

908. And of the public, I believe, also?—Yes.

909. Were you Chairman of the Committee for the promotion of the Conservancy Bill in 1848 and 1849?—I was.

910. Of how many did that consist?—To the best of my recollection, about 40 or 50 gentlemen in all, of North and South Shields.

911. What was the state of feeling at the two Shields at that time upon the subject?—Very strong, indeed. I think it is universally acknowledged that the largest public meetings ever known to have been held in those localities were held at that particular time, namely, during the years 1849 and 1850.

912. I believe Tynemouth became a borough about 1848, and I think you were the first mayor?—I was the first mayor of the municipal borough. It had been a Parliamentary borough many years, I believe, in fact, since the Reform Bill; but it became a municipal borough in the year 1849, to the best of my recollection.

913. And I think you were re-elected the second year?—I was.

914. From your position as mayor during the two years, were you able to become acquainted with the feelings, more particularly of North Shields and Tynemouth?—Particularly so from being called upon repeatedly to preside at various public meetings, and having almost daily intercourse with all classes of the inhabitants.

915. The Bill of 1849, I believe, was lost for want of time?—It was.

916. Did you attend the inquiries before Captain Washington, and also the Committee of the House of Commons?—I did.

917. On both those inquiries was it one of the matters of complaint that in the works which had been executed, no line, either Mr. Rennie's line or any uniform system of lines, had been adhered to?—It was.

918. Was there considerable evidence directed to that point?—There was.

919. And so far as you know, is this statement correct which is contained in Captain Washington's report, that the works executed, so far as could be made out, "at times "agreed with Rennie's line, at times fell far within it, and at other times as far without "it"?—Quite so.

920. Was that what you considered one of the defects in the preceding administration?—Quite so.

921. Has that been cured since by the new Conservancy?—I am sorry to say I think not.

922. So far as you know, have the Commissioners, as a body, had any lines brought before them which have been approved?—I have never seen any.

923. When questions have arisen about licences, for instance, and grants of foreshore, have you had plans showing the quantities that were proposed to be dealt with?—None, to my recollection; I never saw any.

924. In the particular case of Palmer and Brothers, which has been referred to, and Leslie (we will deal with it as one encroachment, comprising that large bight), have the Commissioners ever had plans of that?—I never saw any. A good deal of that went on while I was on the Continent; but I never saw nor heard of any.

925. So far as you know, with reference to the works which have been executed, have you had estimates laid before you of their cost?—Never.

926. You say the Bill of 1849 was lost for want of time in the Lords; I think it passed the Commons in the form in which the Shields committee had presented it, substantially?—It was so.

927. Were the Shields committee satisfied with the Bill of 1849, which had passed the Commons, but was lost in the House of Lords for want of time?—Yes, I should say they were.

928. Was that a Bill, so far as the Commission was concerned, to take one instance, moulded upon a system of which the Shields committee approved?—Yes, to the best of my recollection. The details of the Bill I really do not recollect.

929. Did the Shields committee re-introduce the Bill in the Session of 1850?—They did.

930. Did that Bill contain powers to the Admiralty, or Commissioners named by the Admiralty, to control the local interests?—It did so.

931. (*Mr. Brunel.*) The Bill of 1849 or of 1850?—Both.

932. (*Mr. Webster.*) Will you look at that paper which Mr. Lamb produced yesterday, and read that paragraph. You have seen that paper before, I suppose?—I have.

933. Was Mr. Robinson one of the persons who acted with you on the committee?—He was; he was chairman of the South Shields committee, to my recollection.

934. Do you concur in the sentiment which is contained in this paper? was this circulated at the time?—It was.

935. On the introduction of the Bill of 1850, headed "Tyne Conservancy Bill"?—It was.

936. Does it contain an abstract of the two Bills,—the Bill as introduced by the Shields committee in 1850, and the Bill as introduced by the Corporation of Newcastle?—Yes.

937. "The Tyne Conservancy (Shields) Bill proposes the introduction of Admiralty "Commissioners as a proper check and counterpoise to the partialities of the local Com- "missioners. It allows the Commissioners to elect their own chairman, clerk, and trea- "surer; it proposes to take the whole of the coal dues for Conservancy purposes. It "lays down no fixed scheme of improvements, but leaves the Commissioners to decide "upon and adopt such as may seem most urgent or necessary and practicable"?—Yes.

938. In the Session of 1849, the Corporation, I believe, had no Bill before Parliament?—They had not.

939. You remember that their case in opposition was substantially this, that the river was better, and that no alteration was required?—It was.

940. In the Session of 1850 their Bill was introduced?—It was.

941. Had you spent a great deal of money up to that time?—There were large sums collected in the way of private subscriptions in North and South Shields, the contribution varying in amount, I may say, from 200*l.* to half-a-crown, for many a poor man gave his half-crown towards the subscription. I cannot speak at this moment, but several thousand pounds were collected, I know, by private subscription.

942. It has been suggested here, and it appears to a certain extent upon the face of the Bill, that that Bill was a compromise; upon what points was it a compromise?—The Bill was fought very hard till it got to the Committee of the Commons, and then the Chairman, Sir John Yarde Buller, asked all the contracting parties to retire, and to see what terms they could come to, and I think those terms were left very much to the professional gentlemen; but the Shields people were obliged, as their funds were pretty well exhausted, to accept the best terms they could get.

943. As regards the constitution of the Commission, was there ever any compromise at all?—Never; it was fought to the last, and I must say we were very much dissatisfied with it.

944. It was suggested here, by the town clerk, that it was left to the Committee; was that on the ground that the parties could not at all approach to an agreement upon it?—Quite so.

945. And, in point of fact, was it fought out before the Committee at considerable length?—It was, to the best of my recollection.

946. You say, that the Shields party were never satisfied with it; what results did they anticipate from such a Commission?—The parties thought it would not work.

947. As a matter of fact, has there been, so far as regards the management of the river, and the conduct of the works, any material change since the new Commissioners came into power?—No, I do not think there has been.

948. It has been represented to the Royal Commission, that the Commission has worked efficiently;—what is your opinion on that point?—I am sorry to say, I consider that it has been a complete failure. All the causes which led to the transfer of the Conservancy, I consider, still exist, and more than that, I think that there is a very bad practice existing in this respect; the Commission is materially worked by a system which used to prevail before the passing of the Municipal Reform Act in 1835, by means of committees, who conduct their proceedings with extreme closeness, and keep but a very imperfect record of their proceedings. I am obliged to say it. I am sorry to say it.

949. You say that the proceedings of the Commission have been conducted by committees, which you call close committees?—I do consider them close committees.

950. How long is it since this system of committees has been introduced?—In the year 1851, after a consultation with a gentleman who is connected with the River Tay Trust, I gave notice of a motion for a committee to watch and to report upon the river works, and one of the most eminent and cleverest lawyers in the North of England, who is a member of the River Tyne Commission, Mr. Philipson, rose and pointed out, that in asking for such a committee, I was asking for unconstitutional power, and illegal power, and that it was wrong that the River Tyne Commission should delegate its powers to any committee. I thought at the time his argument so unanswerable, that I withdrew my motion. But, I am sorry to say, that now, in 1855, the principal works of the River Tyne Commission is, I think, done by means of several committees, and I have never seen nor heard of any proper record being kept of the proceedings.

951. Notwithstanding this objection of Mr. Philipson, to which you acceded, were committees subsequently appointed?—Yes.

952. In what manner are the reports of these committees, or their proceedings, if brought up, brought up before the Commissioners?—They are sometimes brought up very suddenly; indeed, I may say, in one particular instance, a report was brought up which superseded a motion of which I had given notice.

953. Do the proceedings of such Committees take precedence of business of which there has been notice of motion?—Yes.

954. On the 28th of September last, did you make a motion with reference to proceeding with the piers?—I did.

955. Did you, in that motion, refer to a resolution of the 4th of May preceding?—I did.

956. Was that resolution of the 4th of May preceding to this effect, and recited by you

Captain William Linskill.

26th January 1855.

to that effect, "With respect to the execution of the works, the Commissioners feel that "their superintendence ought to be in the hands of a person resident on the spot, appointed "by the Commissioners; the resident superintendent, it is proposed, should be recommended to the Commissioners by Mr. Walker, in order that he may have the confidence "of the Admiralty as well as the Commissioners"?—Yes.

957. From the 4th of May until you made that motion on the 28th of September, do you know whether the matter was ever brought before the Commissioners again?—I do not think it was.

958. What did you do on the 28th September?—I introduced a motion substantially to the effect to draw the attention of the Commissioners to the resolutions of the 4th of May, and to move also that the Clerk to the Commissioners should be instructed to write to Mr. Walker.

959. "That the Clerk be instructed to write again to Mr. Walker, and to request that "he will recommend to the Commissioners, with as little delay as possible, a properly "qualified person to act as resident superintendent of the Tyne piers, and one who has "had experience in sea works; and to move also that a copy of this letter to Mr. Walker, "together with Mr. Walker's reply, be recorded in the books of the Tyne Commission" Was that the resolution?—It was so.

960. That was carried, I believe?—That was carried unanimously.

961. What was your reason for putting it in that shape, and requiring the letter to be entered in the books of the Commission?—Simply because Mr. Clayton, the clerk, said that he had communicated the former resolution to Mr. Walker verbally, and when I met Mr. Walker in London, I thought he did not understand it.

(*Mr. Clayton.*) I put it into Mr. Walker's hands.

962. (*Mr. Webster.*) At all events, whatever was the state of the fact which now appears to be in dispute, did you understand from Mr. Clayton that the preceding communication had been verbal, and not by writing?—Yes. I asked this question distinctly in the Commission, and I complained also in the Commission of the clerk having communicated such important resolutions as those passed on the 4th of May verbally, instead of in writing.

963. Up to that time, had you and your brother Commissioners, so far as you had understood it, supposed that the superintendence of the piers was to be intrusted to Mr. Walker?—Solely to Mr. Walker.

964. Was anything said at any time about Mr. Brooks taking the superintendence of the piers?—Nothing.

965. Prior to the 28th of September, had anything been said about Mr. Brooks taking the superintendence of the piers?—I never heard anything.

966. Subsequent to that, have motions been made that Mr. Brooks should take the responsibility?—Not that he should take the responsibility, but that he should assist in making the working drawings, if I recollect rightly.

967. What was the result upon that, do you know?—There was a division upon it; and the object, I think, of Mr. Stevenson and myself, and Captain Purdo, in dividing the Commission upon it, was this: I thought it was a departure from the original agreement with the Admiralty. The Admiralty consented only to allow the piers to go on upon the understanding that Mr. Walker had the sole responsibility, not only for the plans, but for the proper execution of the works, and introducing Mr. Brooks in any form I thought was a departure from that original agreement.

968. About that time, or prior to that, when Mr. Brooks was to be introduced in this manner, had there been excuses made that Mr. Brooks was too much occupied to furnish returns which had been moved for and ordered?—Very often.

969. Did you concur in the opinion that Mr. Brooks really was too much occupied to be able to attend to the piers?—I think it is a general opinion that Mr. Brooks had a very great deal to do, and could not have found time to attend to the piers properly.

970. Do you know whether any additional assistance has been obtained since that time in any way?—I believe after Mr. Walker was here at a meeting of the Piers Committee, a Mr. Plews, senior, an engineer of Cardiff, was called in, who has the charge of the Hay Hole Dock, and he was asked if he could recommend anybody to assist in the working drawings which Mr. Brooks was not able to prepare, and he recommended his own son, Mr. Plews, junior. Mr. Plews, junior, was sent for from a very considerable distance; and that fact, which I consider a very important one, and which is stated on the authority of members of the Piers Committee, is not on record, and is not mentioned in any report to the Commissioners, of which I complain, as a Commissioner, on public grounds.

971. In a report which Mr. Walker furnished to the Commissioners, dated 15th November 1853, reference is made to a communication from Mr. Clayton to him of the 18th of April?—Yes.

972. Was that a subject which, up to that time, had ever been brought before the Commissioners, or for which any authority had been given to Mr. Clayton?—No, none. Mr. Clayton wrote the letter of the 18th of April of his own accord, but the Commissioners afterwards confirmed it.

973. Prior to that communication, which suggested that the plans should be submitted to Mr. Walker, had the matter ever been brought before the Commissioners?—I do not recollect its being brought before the body of the Commissioners. I am not on any of the committees.

974. I believe there has been considerable contest and difference of opinion as to the

precise position and the precise dimensions and length of those piers?—Yes; I believe there has.

975. Do you know whether the plan which the Admiralty sanctioned, as regards extent, for instance, differed materially from preceding plans?—I think they only allowed a certain portion to go forward which could be made by the funds which were provided for by the Act.

976. Have you made yourself acquainted with the published reports of Mr. Rennie and Mr. Rendel by the Commissioners on the 18th of October 1851?—Yes; I have read them,

977. In the plan which you have advocated in the Commission, by what opinions have you been guided?—I have generally been guided by the recommendations, as far as possible, of Mr. Rennie and of Mr. Rendel.

978. So far as regards the question of dealing with the river generally, have you approved of the principle of half-tide training walls?—I have.

979. Have you concurred in the motions which have been made from time to time for adopting that system, and dispensing with the full tide transverse jetties?—I have.

980. Did you hear Mr. Straker's evidence yesterday as to the reason why he preferred the half-tide training walls?—Yes.

981. Do you concur or differ with him, or do you wish to make any observations upon it?—I concur with him in opinion entirely.

982. As regards the deposit of material behind the half-tide training walls, whether of material from the river, or of foreign ballast, do you concur with Mr. Straker in that respect?—I do.

983. Did you take part in the discussions and the report for carrying out ballast, by what is called the hopper system, to the sea?—I think I was present on one occasion. I approve of the system, and it has been found to answer remarkably well at Sunderland.

984. Did you hear Mr. Straker give his opinion yesterday, that it would be very expedient to keep the reserve, so to speak, at the back of these half-tide walls, as a place for the deposit of foreign ballast when it was necessary, the season being such that you could not take it out to sea?—Yes.

985. In your opinion, is that a judicious thing?—Highly so, I think.

986. Do you remember the discussions which took place respecting the licence to Palmer and Brothers, and Bowes and Company, and Ellison and Leslie, for those encroachments?—I was present at some of them—not all.

987. So far as you know have the Commissioners ever had any information before them, or plan and section, or any dimensions to show the quantities of land to be taken?—They never had proper information upon that subject; it was all very dark and mysterious about it.

988. So far as you know, have the terms upon which those licences were to be granted been settled?—No; and I may say that I am personally acquainted with Mr. Macartney, the Member for the County of Antrim, who gave notice of a motion before the House of Commons, and he asked me if I could inform him how it was that Mr. Wilson, the Secretary of the Treasury, could have been so completely misled, in answer to the inquiries which he made, as to inform him that all the accommodation granted at that particular part of the river was merely of a temporary character.

989. As a matter of fact, you, as a Commissioner, are not aware of the terms of any licences having been actually settled.—No.

990. Would the land that was made, and to which that public advertisement referred, have been very valuable land?—Exceedingly so. Mr. Poppelwell, a very competent judge, a Lloyd's surveyor, estimates all the land taken from the river as being worth at 1000 guineas an acre.

991. Do you remember the absence of any plans or precise information as to quantities leading to discussions among the Commissioners, Mr. Philipson and others, upon the quantity that Bowes and Company and those other gentlemen were to have?—I was not present when Mr. Philipson came there as representative of the landowners.

992. You have given your opinion very confidently, that if a Commission of this kind is to work efficiently, there must be some Commissioners, or some control quite independent of local parties?—I have always been of opinion, that there should be the strongest possible government control in some form or another.

993. Is the influence at Newcastle very great?—Immense.

994. In your opinion, is it probable that gentlemen engaged in trade, either at Newcastle or North Shields, can take a very independent course with reference to these matters, without other control?—I do not think that they can act properly for the river without independent control at head quarters.

995. Do you remember motions having been made by Mr. Rayne and Mr. Allhusen, and probably other members of the Commission, from time to time pointing to the course of action which you and those who acted with you approved?—Yes.

996. Do you know of any one instance in which any such motion was prosecuted?—They were withdrawn, I think.

997. I believe you have no interest in this matter, excepting as residing at Shields?—None whatever. I am an owner of property, living at Shields.

998. With reference to the questions which the honourable Chairman addressed to Mr. Straker, as to the nature of the control or the expediency of the control, have you

Captain William Linskill.
——
26th January 1855.

any means of knowing what would be the opinion of the people of Shields upon such a proposition?—When the Shipping Dues Commissioners held their inquiry at the mouth of the Tyne, in the Town Hall at North Shields, the Mayor of that day, Mr. Alderman Mease, entreated the Shipping Dues Commissioners to recommend that the Admiralty should take entire charge of the River Tyne, and the proposal was received in a most crowded Town Hall with cheers, amidst the greatest approbation.

999. You would not dissent from that? you would not consider it, in the terms of the letter of the majority to Sir James Graham, a despotism which every person interested in the banks of the Tyne would rise against?—I believe a large majority of the people at the mouth of the river would be delighted to see the Tyne handed over to an independent body, either similar to that at Liverpool or appointed by the Admiralty, and responsible to Parliament.

Cross-examined by Mr. Seymour.

1000. Do you give Liverpool as an instance of the benefit of these independent Boards, as you call them?—I believe it has been found to work very satisfactorily. There are some dissentients, of course, but I have been in Liverpool occasionally, and I believe it is found a great improvement on the old order of things.

1001. Do you know any work which has been since undertaken?—No; I am not an engineer.

1002. Having been fourteen years in the army, and having gone to reside as a private gentleman at Shields in 1846, you have not been very much acquainted with practical engineering here or otherwise?—Having lived all my life amongst nautical men, and having had a great deal, I may say to do with officers in the Royal Navy, I have always taken a great interest in the River Tyne, and have read with great care and attention all the reports issued from time to time by the Admiralty Inspectors, and especially the Admiralty Report of Captain Calver.

1003. You have spoken of the opinion of Mr. Rennie and Mr. Rendel as guiding you in the conclusion to which you have come; can you point out any portion of Mr. Rennie's report which recommends half-tide walls except at Jarrow?—I think most people consider that from the course of works which has been carried on since Mr. Rennie's time, it would be now impracticable to carry Mr. Rennie's system out, and Mr. Rendel's recommendations are merely with a view of carrying out Mr. Rennie's principles as far as possible; therefore my opinion is that Mr. Rendel's report ought to be acted upon, if possible, at the present time.

(*Mr. Webster*) I will put Mr. Rennie's report into the witness's hand.

1004. (*Mr. Seymour.*) Perhaps you will look at the estimate also, and see whether it makes any estimate for half-tide walls, excepting in Shields Harbour and Jarrow Slake?—No, I do not see any here.

1005. Either in the report or in the estimates?—I do not see it.

1006. You said that no lines had been brought forward at any of the meetings of the Commissioners; has there not been a plan of Mr. Brooks' before the meeting of the Commissioners, as a general rule, whenever new works have been discussed?—If Mr. Brooks would refer to any particular work, I could answer that question better.

1007. Has there not been before the Commissioners a large general plan, to which reference has been made when new works have been proposed to be executed upon the river?—I have never heard yet what Mr. Brooks' river lines are. I never remember seeing any large general plan.

1008. Do you know that Mr. Brooks laid before the Commissioners, and that it was in your possession while you were a member of the Commission, a chart of the River Tyne, showing the works already executed, as well as those which, in his opinion, were necessary to be constructed in order to effect the required improvement of the river?—Does Mr. Brooks refer to those plans which were printed and lithographed at the same time as Mr. Rendel's, in 1851? Those are the only documents I ever saw, and I have them in my possession yet; they were furnished to me.

1009. Have you seen any maps, either lithographed or otherwise, furnished by Mr. Brooks to the Commissioners?—I have them in my possession; they were furnished to me as a Commissioner.

1010. Are Mr. Brooks' lines upon those maps?—They have lines down, certainly.

(*Mr. Webster.*) I do not know whether my learned friend knows, but the great contest was what were Mr. Brooks' lines. Captain Washington said they were visionary.

(*Mr Brunel.*) Is there one of these plans which can be produced?

(*Chairman.*) It would be very satisfactory to the Commissioners to see the identical map to which the Conservancy referred on all occasions.

1011. (*Mr. Seymour.*) Have you seen a report of Mr. Brooks' to the Chairman of the River Committee, furnished in the year 1843, explaining the improvements which he designed in the river, and referring to a plan?—I read it at the time.

1012. Do you know when Mr. Brooks was appointed?—I think about 12 years ago, I will not be certain, to the best of my recollection.

1013. He was appointed some time in 1842?—I believe he was.

1014. Do you remember the following passage in that Report: "In pursuance of the "resolution of your committee, I have delineated upon the accompanying chart of the "River Tyne the works which have been already executed, as well as those which, in my "humble opinion, will be found necessary to be constructed in order to effect the required

" improvement of the navigation of the river"?—Now you read it I think I recollect it, but I never saw any working plans of Mr. Brooks' in my life.

1015. Do you remember the following passage, " It appears that when the late Mr. " Rennie was called upon to give his views for the improvement of the Tyne, its banks were " not at that time so much covered with manufactories, commercial establishments, and coal " staiths, as we find them at the present day, and it was probably owing to that cause that " we find on several portions of his plan evidence of his opinion that the establishments " which existed were not of sufficient importance to cause him to resolve in his mind whe- " ther the removal of the shoals could not be effected by a different disposition or arrangement " of the works to form the improved sailing course"?—I recollect reading that perfectly.

1016. Do you know whether there are blue lines upon the plan furnished with that Report, showing the improved navigable channel, and the proposed alterations which Mr. Brooks contemplated?—I have a plan at home, and there are lines laid down, but they are not what I call proper working plans, and I do not think they would be considered so.

1017. Is that Report in the Appendix to the Report of the Tidal Harbour Commissioners?—That I do not know.

1018. You say that when the second Bill was before the House of Commons, Sir John Yarde Buller advised you to come to terms?—Yes.

1019. And you accepted the recommendation with regard to the general principle of the Bill, but not as to the form of the Commission?—Just so.

1020. I understand you to say that you fought that for a considerable time?—Yes. We were obliged so accept the terms that were offered to us, because our funds were really exhausted; our subscriptions were private ones, and we were fighting against a public purse.

1021. Not having funds enough to resist the general principle of the Bill, you still found funds enough to contest the other point, is that so? However, the constitution of the Commission which was afterwards appointed was arranged by the Committee after a long dispute before them?—Yes; it was arranged by the Committee of the House of Commons.

1022. You have spoken with regard to the principle of the Commission being worked by committees which you have strongly condemned; are these committees open?—I do not consider that they are open, because their proceedings are not reported sufficiently in full; in fact, very often there is no report made at all, but when the reports are brought up they are very meagre and contain but a very faint outline of what takes place.

1023. Is it not the course at a meeting of the Commission to commence the meeting by reading the minutes of the proceedings of the Committee?—It has latterly been so; but those reports I do not think contain a sufficiently full account of what passes in the Committee.

1024. Have you attended many Committees?—I cannot say that I have, because it is my misfortune to differ with many of them, and I have once or twice been insulted when I have been there. I do not like to go there.

1025. In point of fact, you have not attended many committees?—No; I have not.

1026. You referred to the motions which were made with reference to Mr. Brooks assisting Mr. Walker when you and Mr. Stevenson and Captain Purdo divided; do you remember how many were against you on that division?—Not exactly; but there were a great number.

1027. Were there as many as 12?—Yes, I believe there were.

(*Mr. Brunel.*) Which resolution is that?

(*Mr. Seymour.*) It is the one with reference to Mr. Walker having the assistance of Mr. Brooks; a resolution of the 23d of November 1854. Mr. Stevenson moves an amendment,—" That the preparation of the working drawings and specification be en- " trusted solely to Mr. Walker, with the assistance of the resident Piers' Engineer, whom " he has been requested to recommend; and that Mr. Brooks be henceforth relieved of all " responsibility in any respect with reference to the piers."

1028. (*To the Witness.*) You say that division was carried against you by a majority of 12 to 3?—Yes.

1029. Was Mr. Poppelwell in the majority in that division?—He was.

1030. Was Mr. Mather, of South Shields, also in the majority?—He was.

1031. Was Mr. Robinson?—He was.

1032. Is he a Shields gentleman?—He is. Our object, I may observe, in dividing the Commission on that occasion was this: we considered that the majority recommended a departure from the original arrangement with the Admiralty, which I have reason to believe is the case, because I know that the Admiralty have now stopped the piers on those very grounds. A letter arrived yesterday——

(*Chairman.*) You had better not go into that now.

1033. (*Mr. Seymour.*) You say, I think, that the Commissioners had no plan before them with reference to the proposed licence to be granted to Mr. Leslie?—I never saw any plan myself; but it might have been produced when I was absent.

(*Mr. Webster.*) Perhaps, Sir, it would be very desirable, if there were such plans produced before the Commissioners, that we should have them. If my learned friend tells me that there are such, let them be produced. I am only acting upon instructions.

1034. (*Mr. Seymour, to the Witness.*) I will just call your attention to a meeting on the 19th of December 1853. " The application of Messrs. Hopper for leave to drive

Captain William Linskill.

26th January 1855.

" some piles abreast of their quay, in the line shown on the accompanying plan, was " considered, and no objection appeared to the same on examining the locality." " The " Commissioners viewed the site at Hebburn, where Messrs. Leslie apply for permission " to construct works for their iron ship-building yard, as shown on the accompanying plan, " to which application the Commissioners saw no objection." Having called your attention to those minutes, with the book in my hand, do you still adhere to the statement which you made, that no plan was furnished with reference to the proposed works upon the river, and you specified Leslie's in particular?—At that date I do not think I was present.

1035. Were these minutes read at the next meeting? You do not seem to have been a regular attendant?—No, I was not.

(*A plan was shown by Mr. Brunel to Mr. Webster, with lines upon it.*)

(*Mr. Webster.*) I do not deny that Mr. Brooks has had lines and plans, but the point is to ascertain what they were. It is not that Mr. Brooks has had no lines, but that he has had 500, that is the objection.

(*Mr. Brunel.*) What were these lines copied from?

(*Mr. Webster.*) I believe from Mr. Brooks' plan of 1843.

(*Mr. Brunel.*) Where did they appear?

(*Mr. Webster.*) On plans that he produced before Captain Washington.

(*Mr. Brunel.*) Of 1843?

(*Mr. Webster.*) I believe so, Sir.

(*Mr. Brooks.*) It is quite correct. It is in page 344 of the Second Report of the Commissioners appointed to inquire into Tidal Harbours.

(*Mr. Webster.*) That is the 1843 Report?

(*Mr. Brooks.*) Yes; that is accompanied by a plan showing the works already executed.

(*Chairman.*) There is no doubt that Mr. Brooks did make this Report?

(*Mr. Webster.*) None whatever, Sir.

(*Chairman.*) Perhaps we had better not dispute that point any further.

(*Mr. Webster.*) It was never for a moment disputed that Mr. Brooks had made that Report in 1843.

(*Captain Fitzroy.*) I beg to observe, that in this plan, which shows Mr. Brooks' lines as proposed by him in 1849, and which I apprehend to be the plan which was used in the examination before the House of Lords in 1854, when I think Mr. Brooks was engaged on the same side as Mr. Webster, the lines correspond very closely with those of Mr. Rennie.

(*Mr. Webster.*) No, Sir, I was opposed to him then.

(*Captain Fitzroy.*) It is remarkable how very minutely they seem to have been followed out throughout the whole length of the river. The plan certainly shows evidence of a very uniform attention to those blue lines, if the plan be correct, which I suppose it is.

Re-examined by Mr. Webster.

1036. When you told my learned friend that Mr. Brooks had no lines, or that you did not know of any, were you made aware of the plan of 1843?—I was aware that he had proposed lines.

1037. Was it part of the contest before Captain Washington, and also before the Committees of 1849 and 1850, that although Mr. Brooks had proposed lines, and had had the charge of the Tyne under the Corporation, yet the works carried out were neither according to Mr. Rennie's lines, nor according to Mr. Brooks' lines?—Neither.

1038. Was that part of the contest?—Yes.

1039. And was it very much insisted upon?—It was.

1040. Does the evidence of Mr. Nicholson, for instance, as it appears in the Report, before Captain Washington, relate to that subject?—Yes. I may also mention, that I perfectly recollect Mr. Nicholson, the engineer, giving it as his evidence, that for the works in Shields Harbour, Mr. Brooks proposed six different sets of river lines in three years.

(*Mr Seymour.*) I have not asked a question upon that to which the examination is now directed.

(*Mr. Webster.*) The circumstances are these. Mr. Nicholson was then in the employ of the Shields gentlemen; Mr. Nicholson is no longer in their employ.

1041. (*To the Witness.*) During your knowledge of the discussions which have taken place upon these different lines, have there been, both as regards Shields Harbour, but as regards Shields Harbour in particular, and also as regards the upper part of the river, a great number of different lines proposed by Mr. Brooks from time to time?—I believe so.

1042. You said that you had not attended many of the committees, for a reason which I will not refer to; but was your appointment on some of the committees objected to?—Yes.

1043. By whom?—Mr. Philipson.

1044. Do you know on what grounds?—I cannot tell you.

1045. What committee?—The Piers Committee.

1046. My learned friend asked you to point to the passage in Mr. Rennie's report which you said justified the opinion which you had given as to half-tide walls; will you listen to this passage:—" Without these junction walls this could not have been done, as the water " would have spread between the points of the jetties and thrown up sand banks, which " would thus have rendered the channel full of shoals. By the line of jetties laid down by

" me, the surface of the channel, supposing the tide to be confined within these points, will " be reduced to about 896 acres, namely, 448 acres less than it now is at high water." Then he goes on to say, " As it will receive the tide water in the first quarter of flood, and " will retain this water until the last quarter of ebb, it will produce a much greater effect " in scouring the bar in proportion to its quantity than it now does, and in addition to all " these, it is proposed that the height of the jetties shall little exceed the height of half " flood, so that a principal part of the space embanked will still remain as a receptacle for " tide water. According to this plan, therefore, the scouring effect of the tide will be " materially increased, and consequently the depth of water over the bar will be increased " to the depth, I apprehend, of at least two feet?"—Yes.

1047. To your mind, did you understand that as recommending half-tide training walls?—I should think so.

1048. (*Mr. Seymour.*) You consider that so?—I do, indeed.

1049. (*Mr. Webster.*) You said that you understood Mr. Rendel, excepting in certain cases, generally to have adopted that same principle in his report?—Yes.

1050. Was anything ever done, so far as the body of the Commissioners know, upon Mr. Rendel's report?—Nothing.

1051. Did you make a motion that a number of copies of the report should be printed for the use of the Commissioners?—I did.

1052. What was the fate of that?—It was rejected. There were only 50 originally printed; they were very valuable, very popular in my locality, and I made a motion that 200 should be printed, and the motion was rejected.

1053. You were asked as to whether you approved of the Mersey Conservancy. I do not know whether you were aware of the precise constitution of that body?—I think I understood it pretty well; it consists of parties unconnected with the locality altogether, I believe.

1054. Without going into the question of the precise constitution of the Conservancy, do you approve of that species of control?—I do.

1055. Do you remember evidence to this effect before the Committee of the House of Commons in 1849, by Mr. Nicholson:—" The works at Killingworth extend 140 feet " beyond Mr. Rennie's line, and 60 feet beyond Mr. Brooks' line. These works were " erected in 1844, and walls and works, which also go beyond Mr. Rennie's line, in 1846. " These and all other works were done with the sanction of the present Conservators. If " Mr. Rennie's line had been adopted, there would have been a line of quay so as to make " an easy flow for the water"?—I recollect the evidence perfectly.

(*Captain Fitzroy.*) That evidence relates to the state of the river before 1850?

(*Mr. Webster.*) Yes, Sir.

(*Mr. Armstrong.*) This was evidence given at the time the Bill was applied for now constituting the present Conservancy.

(*Mr. Webster.*) It was evidence upon the Bill of 1849. In 1850 the evidence was not gone into to any particular extent, but the two Bills were before the Committee.

(*Mr. Seymour.*) I think this is a very objectionable mode of getting evidence. I was objected to when I asked what Sir William Cubitt had said.

(*Mr. Webster.*) My objection was this, that if Sir William Cubitt's opinions were to be quoted, a report of his should be referred to.

1056. (*To the Witness.*) You were speaking of this alleged compromise about the Conservancy. Was a clause introduced in the House of Lords without your consent, and behind your back?—It was.

1057. What was that clause?—I think it stands 53. An indemnity clause, which was introduced on the third reading in the Lords, without the consent of any of the contracting parties.

(*Mr. Armstrong.*) That has now become law.

(*Mr. Seymour, through the Chairman.*) Were not you represented by legal advisers there?

(*Mr. Webster.*) No, he was not. Our position, Sir, is this: when I was giving a general history of the thing, and referring to the grievances of which these gentlemen complained, I was met by the Town Clerk, who said it was a compromise. I deny that it was a compromise as regards the Commission; and now I ask this gentleman whether a particular clause, already referred to by the Town Clerk, namely, the Indemnity Clause against the acts of the Corporation, was not introduced at the last stage, namely, on the third reading of the Bill in the House of Lords, after our counsel had been present, and when the Bill was considered a settled thing.

(*Mr. Armstrong.*) I think it is perfectly immaterial, and that we cannot notice at all what discussions took place at the time. They are finally determined by the Bill as passed. If it is of any value at all, it is for us to consider whether they ought to be bound by it. We cannot enter into any such investigation.

(*Mr. Webster.*) It was only, Sir, that I, on the part of the minority, might show that it was no compromise on our behalf.

(*Mr. Armstrong.*) Whether it was a compromise or not, we must look at the Bill and assume that parties were properly represented; and now that is the law, and we are bound by it as well as you.

1058. (*Mr. Brunel, to the Witness.*) Do you remember being present when any case of

Captain William Linskill.

26th January 1855.

licence was granted, at which, as you say, no plan was produced?—I think resolutions have been passed about the foreshore occasionally in the Tyne Commission, certainly without plans.

1059. Do you recollect being present on any occasion when a licence was granted without a plan being produced?—I suppose you mean a resolution being passed in due form for an enclosure of land?

1060. Yes.—I certainly recollect resolutions being passed, particularly regarding that part of the foreshore, without plans being produced, and Captain Purdo was constantly bringing forward motions on the subject.

1061. Do you recollect any particular case?—I allude to Messrs. Palmer's case, which made so much noise.

1062. Then in Messrs. Palmer's case, a resolution was passed granting a licence, or whatever is the proper term, without a plan being produced?—Without a plan being produced, certainly.

1063. You were present?—I was present.

1064. And you recollect it?—Perfectly.

1065. Do you recollect any other case?—No, I do not.

1066. (*Mr. Seymour, through the Chairman.*) Were you present at the meeting of the 8th April 1852, when the application of Messrs. Palmer was taken into consideration?—I do not recollect at this moment the nature of the motion to which you refer.

1067. "An application from Messrs. Palmer, Brothers, for licence to erect a quay in "front of premises occupied by them at Jarrow, was read, and it is resolved, that "Messrs. Palmer be requested to furnish a plan of the shore on or before the 20th instant, "when the Commissioners will view it." Do you recollect that resolution being passed?—There were really so many resolutions passed that I cannot say.

1068. (*Chairman.*) You must answer Yes or No, if you please.—Then I must say I do not at this moment recollect the precise terms of that resolution. I could not say for certain whether I was there or not, because my friend, Captain Purdo, was constantly bringing resolutions forward.

1069. Be so good as to leave Captain Purdo out of the question altogether; answer upon your own knowledge without alluding to Captain Purdo or anybody else.—I cannot at this moment say whether I was present or not.

1070. (*Mr. Seymour, through the Chairman.*) Then of your own knowledge you cannot say whether there was a resolution of the kind or not with reference to Messrs. Palmer's case?—I am certain that resolutions were passed with reference to Messrs. Palmer's case, when no plans were produced.

1071. (*Mr. Brunel.*) You have expressed an opinion that works have been executed not according to the lines of Mr. Brooks, at least such I understood to be the purport of your evidence. Can you refer to any particular works down the river which are striking examples of that?—Captain Washington refers to Walker.

1072. Can you yourself refer to any striking point which the Commissioners could see, for instance, if they wished to look to it, which would be an example of a real departure from the lines?—I think, if you examine by the charts, you will find that commencing at Walker and going down that side of the river, Rennie's lines are departed from.

1073. I ask you whether you can point out any good example of a departure from Mr. Brooks' lines?—I do not know that I can point out the particular spot, but I have heard engineers say that it is departed from.

1074. Then you cannot point out any particular spot which we can see as an example of that departure?—I could not point it out, I am afraid, to your satisfaction; but there are departures, from conversation with engineers, and hearing their evidence, and reading Captain Washington's report.

(*Mr. Seymour, through the Chairman.*) Have you ever seen this plan which has just been brought in?

(*Mr. Armstrong.*) Is that the plan which is kept in the office?

(*Mr. Seymour.*) This is the plan always shown before the Commissioners.

(*Mr. Webster.*) What am I to understand this plan to be?

(*Mr. Seymour.*) The plan to which I referred in the questions put to Captain Linskill.

(*Chairman.*) Who substantiates it?

(*Mr. Brooks.*) I substantiate it.

W. A. Brooks, Esq.

WILLIAM ALEXANDER BROOKS, Esquire, sworn.

1075. (*Chairman.*) You produce that plan as the one which is always referred to by the Tyne Improvement Commissioners at their meetings as the working plan of the river?—I do.

Captain WILLIAM LINSKILL further examined.

Captain William Linskill.

26th January 1855.

1076. (*Chairman.*) HAVE you seen that plan before?—It is differently painted, but I think it is very similar to one which I have in my possession.

1077. That plan is stated to be the plan which is before the Board of Conservancy to regulate their proceedings; it is considered as an authentic plan of the river; have you ever seen that, or have you been present when it was referred to by the Conservancy in their proceedings?—I do not recollect seeing this.

JAMES COCHRAN STEVENSON, Esquire, sworn.

J. C. Stevenson, Esq.

Examined by Mr. Webster.

1078. I THINK you are one of the life Commissioners named in the Act?—I am.

1079. Where do you reside?—In South Shields.

1080. How long have you known South Shields?—I have lived there for the last 11 years.

1081. Has your attention been particularly directed to the river?—During the last five years it has.

1082. You probably understand those maps, and the different places upon them?—Pretty generally.

1083. In Captain Washington's Report, at page 10, a jetty is referred to as 60 feet too long, which is called in his Report at the west end of Hebburn Quay. This is the paragraph I refer to. "At the jetty at the west end of Hebburn Quay the intended breadth "of waterway is 700 feet, whereas the actual breadth is only 640 feet. Some 60 feet, "then, must come off the jetty, not long since finished. These are trifling details, into "which I would much rather not enter; but they seemed requisite to show that the Con-"servators of the Tyne, who have been bold enough to abandon Rennie's river lines, "cannot have the most distant idea of what lines they are now carrying out, nor is it "possible they should, as no plan having on it Rennie's lines, the proposed lines, the depth "of water, and the new works, was ever laid before them; at least none such, although "repeatedly asked for, could be produced on the Inquiry." Is that a jetty the situation of which you can now point out?—Yes.

1084. Just show that on the upper plan.—(*The Witness pointed out the same.*) That is the jetty which I understand Captain Washington refers to in the extract just read.

1085. Is that jetty shown in Mr. Calver's report?—Yes.

(*Mr. Armstrong.*) Would it not be desirable to confine your evidence to what the witnesses themselves can speak to? We have all these reports before us; we know what Captain Washington has reported; we know what evidence was given before him, and we shall refer to it.

(*Mr. Webster.*) I was going to identify that jetty for the purpose of knowing its present state.

(*Mr. Brunel.*) We all know that jetty by this time.

1086. (*Mr. Webster.*) What is the length of that jetty now?—I has since been lengthened.

1087. To what extent?—It is one of two jetties, one of which was lengthened 66 feet, and the other 100 feet.

1088. That was by the present Conservators?—By the present Conservato s.

1089. Was an objection made by you or any of the Commissioners to the lengthening of that jetty?—Certainly, it was opposed, but we were outvoted.

1090. Some reference has been made to a plan that Mr. Brooks is in the habit of producing before the Commissioners; is that the plan, or one like it?—That is the plan which Mr. Brooks is in the habit of bringing to the Commissioners meetings.

1091. When questions of encroachment, as, for instance, take the case of Palmer and Brothers, and Bowes and Company, and Leslie, have been before the Commissioners, has there been any plan but that?—At the time when Messrs. Palmer's enclosure was sanctioned by the Commissioners at large, there was no special plan of the work before them; this large plan was before them, and Mr. Brooks certainly unrolled part of it, and pointed out the position of the works on the large plan, but there was no special plan of the work itself.

1092. Had you any plan before you, or any information which would have enabled you or any of the Commissioners to know the area of the encroachment, or the number of cubical yards that would be taken from the river?—There was no proper plan.

1093. Were you ever informed before the licence was granted, or the resolution was come to, of the number of cubical yards that would be abstracted from the tidal area?—I do not think the quantity was reported. Previously to the formal sanction by the Commissioners at large, of this enclosure, the Commissioners themselves held a view upon the place, and a plan was produced on that occasion. A few of the Commissioners standing on the quay, had a conversation round about this plan, and then and there a pencil line was laid down upon the plan, which plan, however, remained in the possession of Messrs. Palmer, and the resolution of the Commissioners, which refers to a certain line, refers only to this pencil line, which was not before the Commissioners at the time the enclosure was sanctioned.

1094. What was the nature of that pencil line as regards extent or direction?—It was a pencil line stretching from Messrs. Palmer's property to what is called the Muckhouse. I do not know whether it was that same line, it was a line in this position.

J. C. Stevenson, Esq.

26th January 1855.

1095. Did that line show the direction in which the wall was to go?—It showed the direction which Mr. Brooks designed on that day when the pencil line was laid down upon the plan.

1096. You say it was left in the possession of Messrs. Palmer and Brothers?—It was.

1097. Had the Commissioners any copy of that, either then or afterwards?—I do not know what they may have now, but they had not so then, and I objected at the time when this enclosure was granted, that referring as the minutes did to this plan, the minutes were unintelligible, as there was nothing defined in the minutes with reference to any plan by which the exact extent of the enclosure might be identified.

1098. When had you first any information as to the quantity of land which was supposed to be granted to Messrs. Palmer and Brothers?—The return, which was ordered of the quantity granted, was not furnished for several months afterwards.

1099. Was that return subsequent to the report of Mr. Calver, do you know?—I could ascertain the dates by referring to my notes, but not from memory; my impression is, that it was previous.

1100. Previous to your seeing a print of the report from Mr. Calver?—No. I think previous to the report being made.

1101. Did any discussion afterwards arise at meetings of the Commissioners as to what was the extent of the grant to Messrs. Palmer and Brothers, or Bowes and Company, or Mr. Ellison?—Yes; there was one meeting. I could refer to the date, if it is of importance.

1102. If you please?—The 22d of August 1853. Messrs. Palmer, accompanied by, I understood, their solicitor, Mr. Philipson, appeared before the Board, and argued that the quantity actually granted was to the whole extent of the line, which I have already described as extending from Palmer's Quay to the Muckhouse, and that the quantity of land granted by the Commissioners was not limited to the $5\frac{9}{10}$ acres which Mr. Brooks had reported as being the enclosure.

1103. Is Mr. Philipson a solicitor?—He is a solicitor.

1104. Did he appear there as their solicitor?—He appeared there and argued the case on behalf of them, I concluded, in the capacity of a solicitor.

1105. Is he also a Commissioner?—He was not at that time; he was previously, and he is now.

1106. Did this also include the licence to Mr. Ellison?—No, there was no licence to Mr. Ellison; but the greater part of the ground which they claimed as having been granted to them, was in front of Mr. Ellison's property. They referred to the wording of the minute, and very ingeniously interpreted the minute by some reference to the particular boundaries of the property. It was by an ingenious collation of Messrs. Palmer's application for the enclosure, and the resolution of the Commissioners on the subject, referring to some position or some boundary line between two properties, that Mr. Philipson's argument was founded that the enclosure in question really extended beyond Mr. Brown's property into Mr. Ellison's, and as far as Messrs. Palmer held on lease from Mr. Ellison, which, I understood, was to the Muckhouse.

1107. Was there at any time any application from Messrs. Leslie?—Messrs. Leslie's first application was on the 19th of December 1853. At that time Mr. Leslie had taken a piece of ground (of course from Mr. Ellison, because it was all his property,) immediately to the east end of Hebburn Quay, just by the letter "Y" on the lower plan in the word "Quay," represented by the bright red spot on the upper plan. He had taken ground there for a ship-building yard, and he came to the Commissioners with an application to be allowed to pave the slope which extended from the high-water margin about half way down to the half-tide wall, which had by that time been commenced in front of the place. The Commissioners viewed the spot, a plan and section were produced, and the application, according to this plan and section, was confirmed at a meeting of the Commissioners on the 12th of January 1854.

1108. Since that, what has been done upon the spot?—Subsequently to that, I think, Mr. Brooks made an application on behalf of Mr. Leslie, or Mr. Leslie applied himself, I am not quite sure——

1109. On the 27th of April, I think?—That Mr. Leslie might be allowed a supply of dredged materials for the paving or making up of this slope, which extended from the high-water margin, as I have said before, half way down to the half-tide wall; and the application was granted, but on the express condition that these dredgings should not be used to raise the place higher than was shown in the section which accompanied Mr. Leslie's first application.

1110. What was the height to which the permission was given to raise it?—The height was expressed by reference to the section, as I have mentioned.

1111. Was that about or above half-tide height?—It was considerably below half-tide height.

1112. On the 4th of May was this matter discussed again?—Yes; there was a discussion and a debate. I had better just read the minutes of the Commission on the point. "A "letter from Messrs. Andrew Leslie, and Company, of Hebburn Quay, asking the per- "mission of the Commissioners to fill up with hard material the slope from their works to "the half-tide walls in front having been read," I moved, and Captain Purdo seconded the motion, "That the application be refused." Mr. Rayne moved, as an amendment, that the application be granted to a certain extent marked on the plan; that is to say,

J. C. Stevenson, Esq.

26th January 1855.

to a certain point westward, granting it in full up to the half-tide walls as applied for. I raised an objection, that this was really alienating a portion of the bed of the river, which was a very serious matter, because, when once alienated, it could never be got back; that this was the first time we had heard of this great increase upon the former application, and that it ought not to be discussed without special notice; but, in order to get over the difficulty of not having had proper notice, it was actually moved that the standing orders be suspended, in order to force on the decision. We resisted that; we were defeated on the question of the standing orders, and we were defeated also by a majority of one upon the question of granting this application.

1113. Will you tell us who voted?—The amendment was "put and carried on a "division, there being for the amendment seven votes, viz. Mr. Cowen, Mr. Dodds, "Mr. Ormston, Mr. Rayne, Mr. Poppelwell, Mr. Armstrong, and Mr. Carr; and against it "six votes, viz. Mr. Straker, Mr. Ridley, Mr. Stevenson, Mr. Robinson, Mr. Clay, and "Mr. Purdo." There was one Shields gentleman in favour of the application, and there was one Newcastle gentleman against it. We usually vote in parties, but there was a little mixture on the occasion.

1114. Did the voters follow the hand of the Chairman on that occasion. I believe the Chairman holds his hand up first, according to ordinary practice?—That is the practice in our Commission.

(*Mr. Clayton.*) This is not taken by the holding up of hands, but the names are taken.

(*Mr. Stevenson.*) The chairman is asked first to vote.

1115. (*Mr. Webster.*) On the 14th of December was there another application?—On the 14th of last December another application was put in by this same gentleman, who had been creeping on.

1116. (*Chairman.*) That is Mr. Leslie again?—Yes. This application was to raise the area, or a considerable portion of the area, up to full-tide mark, and make solid land of it.

1117. (*Mr. Webster.*) What was the fate of that?—There was a considerable discussion and objection raised. It is only about a month or six weeks since it was brought forward; the Commissioners adjourned the consideration of it, and the thing stands over yet.

1118. Were these discussions connected with the subject of these full-tide jetties?—Most essentially; and for this reason, that among the very few things which Mr. Robinson's River Lines Committee (they were appointed in the middle of 1852) could agree upon, was a half-tide wall, which, I believe, they unanimously recommended, from about the Muckhouse up to Hebburn Quay; the gentlemen who had formerly opposed our views on that subject having agreed to this, as an experiment, as they said. But immense importance is attached to Mr. Leslie's case, as defeating entirely the so-called experiment of this half-tide wall.

1119. Did you hear the advertisement read yesterday to Mr. Straker, I think, to identify the spot?—Yes.

1120. When did it appear in the papers?—I took this from the "Gateshead Observer" of September 1853.

1121. To what property does it relate?—It relates to Mr. Ellison's property, which extends from Messrs. Palmer's place, at Jarrow, up to the Pelaw staiths, about $2\frac{1}{2}$ miles.

1122. Have you any idea as to the extent of acreage of that property?—The property goes back into the country; I do not know how far.

1123. I mean of the foreshore?—My only information upon the subject is Mr. Calver's computation. You must refer to his report for it.

1124. That advertisement appeared in September 1853, you say?—Yes.

1125. Who is Mr. Foster to whom reference is made?—Mr. Clayton will correct me if I am wrong. He is the land agent of Mr. Ellison.

1126. Mr. Clayton being Mr. Ellison's solicitor?—I have always understood so.

1127. At the time when that advertisement was inserted, offering land with good water frontage, had any licence been actually granted for this encroachment? On the 14th of December you said application was made to make solid land?—The first application was on the 19th of December, and this advertisement is in September 1853.

1128. Then so far as any decision of the Commissioners is concerned, the question as to whether this is to be made solid land or not is still an open question?—If the recommendations of this River Lines Committee are strictly carried out this will not become solid land.

1129. But that is a matter which rests only with the River Lines Committee, and from which no report has yet been brought up?—There were two River Lines Committees. The first one was Mr. Robinson's, in 1852, the only result of which, as I have said already, was the recommendation of this half-tide wall; they could not work. Mr. Robinson's committee fell through; but Mr. Allhusen's committee was appointed in the beginning of last year. That committee met and discussed several matters, certainly something approximating to a comprehensive line of river works, and they made a report to the Commissioners at large, rather a sort of interim report, because I do not think they themselves consider it to be final. That report came up on the 14th of last September. I moved that the report be printed, in order that the Commissioners might take it home and really consider it carefully, but I have not yet seen any printed copies of the report.

1130. (*Mr. Brunel.*) Was the resolution that the report should be printed carried?—I understood that the resolution was carried.

J. C. Stevenson, Esq.

26th January 1855.

1131. (*Mr. Webster.*) Look at the book and see?—I do not find it on the minutes that I moved it to be printed; I have a most distinct recollection, which will be confirmed by newspaper reports, that I wished it to be printed. One of the Newcastle papers gives a sketch of this report, and says,—"After some discussion, it was ordered that the Committee "should condense these statements into a report, to be printed, and placed in the hands of "each Commissioner for discussion at the next meeting." I do not find anything in the minutes about it.

1132. Is your recollection of this matter, as confirmed by the report which appeared in a contemporaneous Newcastle paper this, that you moved a resolution which was adopted, that the report should be printed?—I wished the report printed; I do not know whether I made the motion myself, and I understood that it was to be printed.

1133. However, it has not been printed, and there does not appear to be any record of it in the minutes?—I find nothing of it on the minutes; I would not argue from that that the thing had not been mentioned; however, I may say that there is sometimes a good deal of confusion at our Commissioners meetings, and it is quite possible that it may have been omitted to be taken down.

(*Mr. Webster.*) The duties of the clerk are very onerous, we know very well.

(*Mr. Seymour.*) I think those observations are hardly fair to the clerk.

(*Mr. Webster.*) He is very fair; I am quite sure Mr. Clayton will not misinterpret what I say.

(*Mr. Seymour.*) The witness does not say that he moved a resolution.

1134. (*Mr. Webster, to the Witness.*) The harmony of the Commission, so far as regards accordance of opinion, I believe has not been very great?—No; we have had some scenes occasionally.

1135. I will ask you a few questions (as you, I believe, have perhaps more accurate information on these points than any other member of the minority) about Hebburn jetties, and shoal, and dates. I have already asked you about what we may call Captain Washington's jetty. About February 1850, do you remember Mr. Clayton making any representation to a meeting of the Commissioners as to the depth which was to be obtained if works then proposed were sanctioned?—No; what I refer to was Mr. Clayton's opening speech at the inquiry before Messrs. Lawes and Abernethy in 1850. Mr. Clayton stated that a depth, I think, of 16 feet 4 inches had already been got over Hebburn Shoal.

1136. Was that the fact?—I do not know of my own knowledge whether it was the fact or not; that is what was stated at that time.

1137. In December of that year was there any report from Mr. Brooks?—I have Mr. Brooks' printed report before me of December 1850; that was about a couple of months after the Commission commenced.

1138. What was Mr. Brooks' statement or recommendation at that time?—Mr. Brooks then recommended this. It was in reference to complaints which had been made by the proprietor of Walker Colliery, which, you will observe, is just opposite Hebburn Quay, that the sand was growing up in front of his works, and that he could not get depth of water; and Mr. Brooks said, "If the Commissioners for the Improvement of the Tyne continue "to me the confidence with which I have been hitherto honoured, and allow me to execute "the works which are yet incomplete, and the adoption of temporary measures to accelerate "that which the current is now slowly performing, I feel quite certain in my own judg- "ment of speedily clearing away the only difficulty which now exists to vessels of 16 feet "draught getting up to Newcastle in ordinary spring tides. For this purpose I advise the temporary lengthening of the two jetties on the west side of Hebburn Quay, the westernmost to an extent of 66 feet, and the other of 100 feet in the first instance, and afterwards, if advisable, for the reasons above stated, the further construction of the "jetty planned originally by me near the centre of Hebburn Quay, but that it should "be extended 200 feet in length. The whole of these works will not, however, cost 500*l.*, "including timber and iron, most of which will be available for other works after the "lapse of about three years."

(*Mr. Brooks.*) That is incorrect.

1139. (*Mr. Webster, to Mr. Stevenson.*) Is that a paper printed by order of the Commissioners?—Yes; we have got a whole series of Mr. Brooks' reports upon that subject.

(*Mr. Brooks.*) It is a misprint; it is only 100 feet.

(*Mr. Stevenson.*) If it is a misprint, as Mr. Brooks says so, I will correct it; it is not an important one at all. I do not know the fact.

1140. (*Mr. Webster.*) At all events, is this a paper headed "Tyne Improvement Com- "mission;" "Received and ordered to be printed for the use of the Commission," and headed "Hebburn Shoal," being a report of Mr. Brooks', dated the 26th of December 1850, and addressed to the Chairman of the Tyne Improvement Commissioners?—It is.

1141. On the 14th of August 1851 did you receive another report from Mr. Brooks?—I believe so. Then he reported this—I will just read the paragraph, it is very short: "For the information of your Board, as well as for the trading interests of the town of "Newcastle, I have to report that, in the worst part of the navigation, namely at "Hebburn, there is a depth of 4 feet at low water of spring tides, when the surface of the "latter is at the level of 12 feet 10 inches below the datum line, or high water of the "spring tide, from which the soundings are calculated on Mr. Rennie's plan of 1816." That was equal, you will observe, to 16 feet 10 inches at that date over Hebburn Shoal by Mr. Brooks' report. He goes on further, "When I am allowed to carry into effect the

" works referred to in my report to your Board in December last, I shall be able to certify " to a depth of 18 feet over Hebburn Shoal from the same datum."

J. C. Stevenson, Esq.

26th January 1855.

1142. On the 22d of December was the state of Hebburn Shoal again the subject of consideration?—On the 22d of December, at a meeting of the Commissioners, Mr. Brooks presented another report on Hebburn Shoal; this was a year after his first one. He says,— " Nearly twelve months have elapsed since my report of December 26th 1850 called the " attention of your Board to the state of the navigation abreast of Hebburn Quay, and " showed that, by an outlay of less than 500*l*., Hebburn Shoal would cease to be the blot " upon the navigation of the River Tyne, which it has hitherto been, notwithstanding the " frequent dredging operations there (June to August 1851, 21,629 tons)." He goes on,— " I have now to report that the like expenditure is again becoming necessary, unless your " Board will allow me to construct the works I have recommended." He also reports,— " On Hebburn Shoal there is 16 feet 6 inches at present, but which depth will soon be " reduced to 16 feet." He requests to be honoured with instructions to remove Hebburn Shoal, and states that, " until this change be effected," that is, the change in the direction of the current, " Hebburn Shoal must remain, and with it a contracted navigation in the " concave channel immediately below." A discussion took place upon this report; a motion was made, I think, by the late Mr. Lowrey, I am not sure.

1143. Who was he?—He was one of the Newcastle Commissioners, an Alderman of Newcastle. The motion was, that Mr. Brooks be allowed to execute the works in question, and all those gentlemen who supported the motion did so upon the ground that, in accordance with the expectations held out by Mr. Brooks, it was very much better to incur the expense at once (it was only to be the temporary expense) of those jetties, excavating Hebburn Shoal, and doing without any more dredging at that point. Mr. Straker moved, as an amendment, that the thing be not granted, alleging as his experience of jetties, that they only shifted the sand from one place to another. I supported him, on the ground that the thing should be delayed for further consideration, because at that time my opinions were not so decided upon jetties as they are now. It was put to the vote, and the jetties were ordered by a majority of 10 to 5. Captain Purdo voted in the majority, I have no doubt.

1144. (*Mr. Clayton.*) Against you?—Yes; against me. It was intended as an experiment, as I understood at the time.

1145. (*Mr. Webster.*) Was your view of the understanding upon which those jetties were adopted, that they were an experiment?—I mention it as a reason for the apparent anomaly of Captain Purdo voting against his usual side. But unquestionably the other gentlemen of the majority, as far as I could collect from the debate, supported them on the expectation that Hebburn Shoal would go, and go without any further expense of dredging. It was certainly a very cheap way of getting rid of it.

1146. What has been expended in the way of dredging in money since that time upon Hebburn Shoal?—Another report was requested by Captain Purdo from the engineer upon that very question of dredging. Upon the 22d of December 1851 the jetties were sanctioned. From February 1852 to March 1852 14,444 tons were dredged.

1147. (*Mr. Seymour.*) What are you now reading from?—From another report of Mr. Brooks, which have been plentiful upon this subject. " Received and ordered to be " printed for the use of the Commission," and dated March 10th, 1853. When I say dredging at Hebburn Shoal, I am not identifying any particular mathematical point in the bed of the river, but the district in the neighbourhood of Hebburn Shoal, both on one side and the other, within a very short distance.

1148. (*Mr. Webster.*) Does that report of Mr. Brooks state what was done in this neighbourhood in reference to this dredging?—Yes; from February 1852, to the 30th of March of that year, he reports 14,444 tons " in attempting to cut a passage through the " Walker Sand in lieu of the dangerous tortuous course over Hebburn Shoal." Then, between March and May of the same year, the dredger was engaged in widening the deep channel abreast of Coxlodge, and raised 2,894 tons. Coxlodge Staith, I think, is below Hebburn Shoal. There are one or two small dredgings for launching ships, which are not worth mentioning.

1149. (*Chairman.*) I suppose that is what is called on the plan Cockcrow Sand?—Cockcrow Sand is in the neighbourhood.

1150. (*Mr. Webster.*) This was the dredging that took place after the jetties which were called experimental were erected?—Yes; what I have now read.

1151. On the 24th March 1852, have you another report from Mr. Brooks?—Yes; I may mention that in order that a fair trial might be given of the effect of those works. I moved that a survey should be made of the neighbouring reach of the river before the extension of the jetties, and that those surveys should be repeated from time to time and laid before the Board, in order that they might come to a proper conclusion upon the subject. Mr. Brooks, in March 1852 (I have lost my copy of the printed report, I must refer to a newspaper copy), states this ——

(*Chairman.*) State what your own knowledge is on the subject.

(*Mr. Webster.*) It is one of the papers issued by the Commissioners, Sir, which Mr. Stevenson has mislaid.

(*Mr. Stevenson.*) " A report was read from Mr. Brooks, accompanied by elaborate " soundings of the river (taken during the last two months) from Tyne Bridge to Hayhill " Point, by longitudinal sections." I do not remember any other occasion but this one, on which Mr. Brooks presented to the Board a longitudinal section of the river; he did so

J. C. Stevenson, Esq.

26th January 1855.

on this occasion, and he accompanied it by a report, stating that he had obtained 17 feet 6 inches of water over Hebburn Shoal, and also that, "to perfect this part of the "navigation, it may eventually become necessary to construct the jetty at Hebburn Quay, "recommended by me in my report to the late Conservators of the Tyne, in 1843. I "have, however, the satisfaction of showing, that the available depth of 17 feet to "Newcastle, promised by me at that time, is already realized." He gives also the soundings in various other reaches of the river; and I should call your attention to what he says of the state of the Long Reach. "In the Long Reach, or over the worst part of "Jarrow Shoal, 18 feet 6 inches," and he concludes his report by stating, "I have but to "state that, with the present available means, I expect to be able before the end of this "year, to have an available depth of 18 feet up to Newcastle Quay."

1152. That being the statement made in March 1852, has it been at all realized?—I should say not.

1153. Since that, how many thousand tons have been dredged out of the river in the Hebburn Reach? From the 16th of February to the 30th of March, there was a considerable amount of dredging, was there not?—There has been from time to time. From the 24th of December 1852 to the 15th of February 1853, 15,786 tons were dredged; that was after this report of March.

1154. Then after this report, when this depth was promised, there was this very considerable amount of dredging; was there also a widening at Coxlodge?—The dredger was still there to widen at Coxlodge.

1155. Do you remember to what extent?—3,114 tons.

1156. That is stated in that report?—It is.

1157. I will bring you down to the 21st of July 1852?—There is another report of a similar character: "Having been directed by your Board to report upon the state of "Hebburn Shoal, I beg to state that I find it, upon careful sounding, to be in very nearly "the condition it was in after the close survey made shortly after the elongation of the "jetties in the Bill Reach, which jetties had the effect of materially increasing the depth "on it. The present depth is about 4 feet at a clear ebb, or from the level of low water, "previous to the recent depression of that level. That depth, however, varies, as there is "frequently 4 feet 6 inches at low water; and I have the satisfaction of reporting that "there does not exist at present any necessity for dredging operations, the natural scour "appearing to be sufficient to maintain the depth given above, which is about the same as "is found in some parts of the Bill Reach." A little further on he says, "The dredging "required in the navigable channel is of a very light description for the whole distance of "the navigation between Newcastle and Shields, consisting merely of easing off the "points of St Anthony's Sand, and the several cuts detailed in the longitudinal sections "lately presented to your Board. The dredging vessel will therefore, I expect, be in "future almost entirely available for the purpose of keeping open the various shipping "berths to their required depths."

1158. Have the complaints as to the growing up of these shipping berths been very urgent? has the dredger been constantly employed since that time upon these berths referred to?—Not constantly upon the shipping berths; there has been since then a great deal of channel dredging to do.

1159. Were there complaints of the want of the dredger at the shipping berths?—The dredger is continually, at least very often, required for shipping berths, in fact, to so very great an extent that there is more demand for shipping berths than can possibly be supplied by the dredger.

1160. (*Captain Fitzroy.*) Shipping berths at what place?—Various collieries and quays.

1161. Where? near Newcastle, or near Shields?—She has lately been employed in clearing out some shipping berths at Jarrow Quay, and in clearing out shipping berths in the Hay Hole, where the Northumberland Docks are to be made, at Fairless's ballast quay, and at the wharf of the Chairman of the Commissioners, and at Willington Quay; she has to be there in her turn.

(*Chairman.*) I have been listening very patiently to this examination for an hour, and I have not the most distant idea what is the object of it.

(*Mr. Stevenson.*) My object in bringing forward these facts is to show that the expectations held out to us by Mr. Brooks in his reports, have been very far from being realized.

1162. (*Mr. Webster.*) As I understand you, Mr. Brooks represented from time to time to the Commissioners, that if he were allowed to erect these jetties, upon which there is so much difference of opinion, it would answer perfectly, and supersede the necessity of dredging?—Yes.

1163. Has that been the fact? Has it answered the expectations?—There has been an immense quantity of dredging thereabouts.

1164. Then, so far as your experience goes of any information which has been furnished to you, is it confirmatory or not of the opinion expressed by the minority against the system of transverse jetties?—I consider it conclusive against the system of transverse jetties, and partial operations too.

1165. In January 1853, was there a report advising additional jetties of a temporary nature?—Yes; there was a discussion about the same period in the Commission, when, by a majority of one, it was resolved that instead of those additional jetties by which Mr. Brooks wanted to cure Hebburn Shoal, which, by this time, had got shallower than ever,

J. C. Stevenson, Esq.

26th January 1855.

another course should be adopted. Mr. Brooks states, in his report of March 10th, 1853, that the navigable depth had been in the early part of the year only 2½ feet at low-water spring tides; adding 12 feet 6 to that makes it 15 feet.

1166. Was there a report at that time that there was only 2½ feet upon Hebburn Shoal?—The report is in March 1853; but it states that that depth of 2½ feet had existed previously in the early part of the same year.

1167. Mr. Brooks reports, in reference to the early part of the same year, that there had been only 2½ feet?—Yes, after the jetties.

1168. Was there at that time any recommendation for further jetties?—No; not in March, in January. I am confusing the dates a little. The report was in March; but the report of March 1853 did not give the 2½ feet as soundings in March 1853, but as the state of the soundings subsequently to this report, which I now have of the 27th of January 1853, in which Mr. Brooks reported in reference to the half-tide wall which had been carried by a majority of one.

1169. On the 13th January had there been an amendment in favour of half-tide walls?—Yes; an amendment in favour of the adoption of the Report of Mr. Robinson's River Lines Committee against Mr. Brooks' advice.

1170. On the 13th January, or thereabouts, was there a resolution of the Commissioners adopting half-tide walls, as against Mr. Brooks' transverse full-tide jetties?—Yes.

1171. Was that a recommendation which had been come to during what you call Mr. Robinson's River Lines Committee of 1852?—Yes.

1172. Had that Committee reported that these temporary measures had been unsuccessful, and recommending the half-tide walls?—The Committee gave no reasons for their opinion, but those who supported the recommendations of the Committee on that occasion gave that opinion.

1173. Now I will go to the 27th of January 1853. What took place then?—Mr. Brooks reported that half-tide walls took a long time to make. That it would not be energetic enough, and he would adopt the more energetic recommendation of his previous reports, namely, "the formation of the two jetties abreast of Hebburn Quay, to continue "the beneficial impulse already given to the current of the ebb by the jetties which have "been constructed above Hebburn Quay." I may state, regarding this 27th of January, that there is still some confusion about it. There is no doubt that at a previous meeting a majority of one had recommended the formation of the half-tide wall, and rejected the proposal of the jetties; but at this meeting a fortnight after, on Mr. Brooks' representation that the jetties would facilitate the construction of the half-tide wall, (there is no resolution, but there was a sort of conversation,) the tidal-water gentlemen, the gentlemen of our party, reluctantly gave way, and allowed the jetties to go up there, as a means of facilitating the construction of the half-tide wall; they were to be very temporary.

1174. Were those gentlemen whom you represent as the tidal-water gentlemen, who had carried the amendment in favour of half-tide walls on the 13th of January, induced on the 27th of January to acquiesce in Mr. Brooks adopting the jetties?—Yes.

1175. Now we come to the 31st of January 1853, I think?—Now comes the report of the 10th of March 1853, when he reports on the effect of this additional lengthening. He says, "On the 31st of January the jetties on the south shore were commenced, and "their almost immediate result was the clearing out of the east end of the northern chan-"nel to the depth of 4½ feet at low water."

1176. At that time, what was stated to be the water in the new channel?—4½ feet at low water. He stated on the 10th of March that that was the case in January.

1177. Had the navigation then become narrowed?—That extension of the jetties was followed by a narrowing of the channel of the navigation below, between Cockcrow Sand and the north shore.

1178. Did that render it necessary to give any official notice to vessels?—Yes.

1179. Of what nature?—A notice that the number of vessels which had previously lain in the channel must be reduced, so as to have one line at a time instead of two, or something of that sort, so as to have a more free passage. The harbour-master was ordered to give a notice of that kind on the representation of some parties that the channel was too narrow there.

1180. Was that notice continued so late as July of last year?—In July of last year an advertisement was put out by the harbour-master that, instead of having any vessels at all at the tiers, there the vessels must be kept close into the shore, and the mooring buoys which were in the channel were removed, and dolphins were driven into the chalk wall on the north shore for the purpose of tying the vessels close up to this north wall, so as to allow of the navigation being free past them.

1181. Do you agree in the representation which was made yesterday by Mr. Poppelwell, that whatever may be the state of the sailing channel, as regards depth, the channel generally has been narrowed?—It comes before me. To my knowledge, as a Commissioner, I am certain that the channel has been narrowed.

1182. (*Mr. Seymour.*) Where?—Between the Cockcrow Sand and the north shore.

1183. (*Mr. Webster.*) To what part of the river did this notice, which you say was issued by the harbour-master as late as July last, refer?—To the part of the river immediately below Hebburn, on the north side.

J. C. Stevenson, Esq.

26th January 1855.

1184. On the 10th of March, I think, Captain Purdo also asked some questions, or made a motion, did he not?—I do not remember what you refer to.

1185. Will you look at the minutes of the proceedings of the 10th of March?—I think I remember now. Captain Purdo asked for information, and repeated his question several times, what the engineer really intended to do with this long stretch of shore from Jarrow to Pelaw; whether he intended to make it solid wall or jetties, or how it was to be? He repeated the question at more than one meeting, and he could not, I think, extract from the engineer any positive expression of his intentions with regard to it.

1186. Was it about that that Captain Purdo made his motion, which has been referred to, that sections showing the actual state of the river should be furnished to the Commissioners from time to time?—I do not remember that particular motion.

1187. Longitudinal sections?—He has asked for longitudinal sections.

1188. I believe none such have been furnished?—I only remember that one which has been mentioned, which showed the river to be in such a very excellent state.

1189. On the 28th of April 1853, I think there was a further report of Mr. Brooks, with a recommendation that Bill Reach should be dredged for a fortnight, in order to get 17 feet up to Newcastle, or something to that effect?—Yes; and in order that the Sardinian frigate might get down the river without being trimmed; it was a fortnight's dredging.

1190. How much dredging was that, do you know?—There was a good deal of dredging wanted before the Sardinian frigate could come down drawing 16 feet.

1191. Will you refer, on the 22d of September 1853, to a motion which took place respecting the dredged materials being placed behind the walls?—It was only a conversation, but it was a complaint of our party that Mr. Brooks was putting dredged materials behind those so-called experimental half-tide walls, and as far as my recollection serves me, confirmed by a newspaper report, Mr. Brooks was ordered not to put any more behind.

1192. On the 19th of December of that year, was there the first application of Mr. Leslie's, which was the subject of conversations at different meetings from that time until the 4th of May, of which you have already given us the result?—Yes; I refer to this enclosure of Leslie's gradually going on to show that the intentions of the River Lines Committee were not really being carried out, because it was avowedly as an experiment, one of the principal points in dispute, which that experiment was to settle, being this, whether half-tide walls when they were made would, as Mr. Brooks always asserts, gradually fill up to solid land, and we wished that nothing should be actually put into those places, because it would spoil the effect of that experiment.

1193. You have referred already to Mr. Robinson's River Lines Committee, and you have said that they recommended half-tide walls, but that practically no result came of it?—There is a half-tide wall, no doubt, being made there now, but it is crossed by full-tide jetties, which actually in some cases project beyond the line of it; which jetties were only to have been temporary three years ago, and were by this time to have been all used up and applied to some other purpose, and there they are still.

1194. Were you and those acting with you anxious, and have you done all you could to obtain a suspension of this system of full-tide transverse jetties?—Yes; we were quite aware of the great importance of adopting some uniform straightforward system of river works from end to end of the navigation, but we were anxious from the very first to suspend the system of river works which had been condemned by the Admiralty engineers previously, in order that we might have time to consult about a comprehensive system for the future; but our attentions have been so distracted by the efforts to get what we considered, to say the least of it, a doubtful system suspended, to clear the way for a new comprehensive measure, that really although this new comprehensive measure is a little nearer completion now than it was, yet that is the reason why it has not been more rapidly carried on.

1195. Did you approve, so far as you understood it, of the system of half-tide walls?—I was very slow in coming to any conclusion upon the point, but in the discharge of my duty as a Commissioner, I thought it my duty to read all I could upon the subject, and amongst other things, especially Mr. Rennie's report of 1813, and I saw by that report that the principle upon which he would treat the River Tyne was to adopt such training measures as were consistent with the preservation, as far as possible of its full tidal capacity, on account of the lower channels of the river and the bar. And as I read Mr. Rennie's report, the plan which he shows is the adoption of half-tide walls, leaving the spaces on each side of them to be overflowed with water every tide, also the cutting off of points and generally training the river.

1196. Did you approve of half-tide walls on the ground which Mr. Straker referred to yesterday?—I do not altogether agree with everything that Mr. Straker said yesterday. I agree with half-tide walls, very much on so high an authority as Mr. Rennie, without pretending to an engineering opinion, because I think that Mr. Rennie makes out a most reasonable case in favour of that.

1197. Did you understand this also to be the principle recommended by the Tidal Harbour Commissioners Report?—I have read those reports, and have observed the same caution regarding the preservation of tidal water for bar harbours very strongly laid down.

1198. Were you guided in the course which you have taken, by what you understood to be Mr. Rennie's recommendations, and confirmed by the Tidal Harbour Commissioners?—I was.

1199. Do you know whether this report of Mr. Rennie, of 1813, was approved at any

J. C. Stevenson, Esq.

26th January 1855.

time by the authorities of Newcastle?—I observe by a report of Mr. Clayton's speech to the Municipal Inquiry Commissioners, in 1833, that he takes credit for the Corporation of Newcastle having employed Mr. Rennie, remarking that they certainly could not have employed a better man.

1200. Do you know whether that really was carried out, or is now being carried out?—I should say, that certainly no one can pretend to say that Mr. Rennie's report was carried out.

1201. Are you acquainted with Mr. Rendel's report?—Yes. The first thing which the River Commissioners did on their first meeting, in November 1850, was to order a report from Mr. Rendel, who had surveyed the river on behalf of the Corporation of Newcastle, and had given evidence, but who had never made a report; and his report was ordered to be given to the Commissioners, with a comprehensive plan of improvement of the river from end to end.

1202. Did you yourself, and do you know whether your brother Commissioners applied for this report of Mr. Rendel, before you expressed any decided opinion upon the course which ought to be adopted?—Mr. Rendel was a marvellously long time furnishing his report; we waited ten months for it, I think, and meantime there were scarcely any discussions upon the point, every one of us suspending our action until we should get it.

1203. Did you receive at any time a general report from Mr. Brooks?—Yes; at the same time that Mr. Rendel was ordered to report, Mr. Brooks was also ordered to report, and they both reported at the same time.

1204. Was there at any time any adoption of the system that Mr. Brooks recommended in his report?—Neither Mr. Rendel's nor Mr. Brooks' report has been adopted.

1205. Which of Mr. Brooks' reports do you refer to?—That of 1851. There is a report and a supplement; it is dated July 1851; but he kept it in reserve, so as to present it simultaneously with Mr. Rendel's.

1206. There is also a second report of November 5th, 1851, I observe?—Yes.

1207. And in the interval between these two reports, as they bear date, you received Mr. Rendel's report, I think?—Yes; we received Mr. Rendel's report about October.

1208. In the conduct of the works, as it has been going on in the river, has it been substantially carried on by Mr. Brooks without any express directions from the Commissioners?—In a certain sense. I must explain what I mean. When the River Commissioners entered upon their duties, they found a full-tide wall in the course of construction at Willington, at Walker, and about Wallsend, with which Mr. Brooks was going on under the old Conservancy; he just went on as he had been doing, without any express instructions, and at first there was no opposition made to it, because we waited for the two reports.

1209. From after the time when you received Mr. Rendel's report, did you, and a number of those who acted with you, endeavour to get that system stopped, and the half-tide training walls carried?—Yes, by the time Mr. Rendel's Report had been received; for my own part I had made up my mind that the principles advocated by Mr. Rennie and Mr. Rendel ought to be adopted for the conservation of this river. I am not speaking of particular river lines, or the details of the river works, but the general principle that the river above Shields Harbour was to be treated as a tidal receiver.

1210. What is your opinion upon the suggestion which has been made, that embankments, protected by half-tide walls, would grow up to full-tide embankments, without any deposit of materials upon them?—My every-day business is on the margin of Jarrow Slake, and by what I have seen myself of the effect of heavy gales of wind in removing considerable quantities of deposit which have grown upon the Slake, and silted up in calm weather, I feel very confident that although the natural tendency of those places might be to silt up to the full tide, yet, looking to the action of the waves in the Long Reach, which is extremely exposed to westerly gales at the lower end of it, and, in fact, the whole of the river below Bill Point is very much exposed to westerly gales, the waves lash the shore with so very great violence, that I am satisfied, from what I have seen, that it would prevent the growing up of those foreshores to full tide, as Mr. Brooks anticipates. And, moreover, where the half-tide walls and quarter-tide walls have already been built of various heights along the Long Reach, any one may observe that the silt has just grown up to the height of the walls, and there it remains. Of course, the jetties shelter the places under the lee of them from the lash of the waves, and they are higher than they would be if they were more exposed.

1211. Are you acquainted with the Ribble?—I have gone from curiosity and visited that river.

1212. I believe works have been carried on there under Mr. David Stevenson?—He has been engineer of them.

1213. Do you know whether there the old cross jetties were rooted out, and parrallel training walls were substituted?—Parallel walls were adopted there.

1214. Was the system adopted there, the making of low training walls, and then dredging in the channel and placing the materials at the back?—I do not think there was much dredging, but they made the walls.

1215. Was a similar system, so far as you know, carried on in the Tay and the Lune?—I do not know the Tay. I have seen the Lune, and visited it for the purpose of seeing the walls there. The foreshores there have not grown up; there is not any loss of tidal water

J. C. Stevenson, Esq.

26th January 1855.

by adopting the walls, and the channel has been very much improved. I mention this of course to confirm my opinion.

1216. Some honourable members of the Commission have asked some questions as to new works that have been commenced and going on since the new Commission came into operation in 1850?—There has been scarcely anything worthy of the name of new works done at all. Of course I except the Northumberland Dock, which is a very important work, to which I have no objection whatever, which I quite agree with; and there is also the still more important work of the piers; those are going on under the Commission; but most of the controversy has arisen regarding the training of the river in the upper navigation above Shields.

1217. Those works, the Nothumberland Docks and the piers, are works which have been carried on under distinct Parliamentary powers, under the sanction of the Admiralty?—Yes.

1218. To those I understand you have no objection?—None.

1219. But as regards general conservancy works and the general training of the river, I understand you say there have been no new works, excepting those at Jarrow and the extension of existing works?—Yes.

1220. With reference to the character or the success which has attended Mr. Brooks' engineering works, are you of opinion that they have been successful?—I am decidedly of opinion that they have been a total failure.

1221. Have you taken a good deal of interest in the ballast question?—One argument used against the adoption of full-tide embankments was, that we must have some place to deposit the ships' ballast, which is the great curse of this river, and dredged materials. I made myself very thoroughly acquainted with the system of disposing of those things, which is followed in the neighbouring river of the Wear, where I found that the practice had been to take them to sea in hopper barges and empty them in the deep water of the sea; and I have for some time past very strongly urged and done all I could to get the Commissioners of the river to adopt the same system, not only because it was in itself very considerably cheaper, and if it could be adopted might be a saving to the shipowner as to his ballast, and to the river Commissioners as to the dredgings, but also as removing the only plausible objection which was raised to the filling up of those foreshores by the deposit.

1222. As a question of cost compared with the present cost, did you ascertain what would be the cost of the hopper system?—I was perfectly satisfied that the dredging could be done for less than half its present cost. I was going to say, one third, but I wish to be safe.

1223. Did you direct your attention to the cost to the Conservators of the hopper system, as regards foreign ballast as distinguished from dredged materials?—Not so particularly. The Shields shipowners are very earnest in wishing the adoption of hopper barges, as being a cheaper mode of conveyance. I believe it is somewhat cheaper, but it must not be supposed for a moment, that ships' ballast can be taken to sea and disposed of at anything like the same rate per ton, that the immense quantities raised by a dredging machine can be done.

1224. But on the whole, did you satisfy yourself that the ballast might be disposed of by the hopper system at a very much less cost than it now costs the Conservancy?—The dredged ballast?

1225. The ballast generally?—Most decidedly, but more particularly as to dredging.

1226. Was that the subject of a specific report to the Commissioners?—It was.

1227. Of what date?—A report of May 1852, which was signed by myself and other members of the Finance Committee of the Commissioners. I will hand it in.

1228. Was Mr. Brooks ordered to report upon it?—He was ordered to report upon what it would cost the Commissioners to adopt the system for the dredgings.

1229. Did he report?—He gave in a report at first (I forget the date of it), objecting to the adoption of it, but afterwards being more peremptorily ordered to report as to the cost of adopting it, he handed in this report of 27th October 1852.

1230. Have those who usually support Mr. Brooks upon the Commission, ever afforded any facility for the trial of this hopper system?—I can only say, that it has never been resolved that it should not be adopted; it has been acknowledged that it would be an improvement, but from one thing and another, the fact is, that it has not yet been adopted, although I may mention that in getting a new dredging machine, which the Commissioners are now doing, it was resolved that it should be worked by means of hoppers. I wished the system to be adapted to the present dredging machine, but I was overruled in that.

1231. According to the present system, the Conservancy pay, for instance, to the Corporation and others, a certain sum for providing a place of deposit for the ballast?—Yes. As Conservators they are under the obligation of receiving ships' ballast, and providing a place of deposit for it.

1232. For which receipt they get 16*d.* a ton, I think?—Yes.

1233. As Conservators?—As Conservators.

1234. Then for receiving that 16*d.* a ton from the ships, they must provide a place of deposit for it?—Yes, which they do by a sort of sub-contract.

1235. Have the Corporation of Newcastle a sub-contract for so providing a place of deposit?—Yes; they are ballast conveyors under the Commissioners.

1236. Do the Corporation of Newcastle make a profit of that at the present moment?—I observe by their published accounts that they do.

1237. What is the profit which they make by it, according to their last accounts. I believe it is 800*l.*?—700*l.* or 800*l.* a year.

1238. When the terms of the payment to the Corporation were proposed and settled, was there an opposition to it, on the ground of its being too high?—Yes; Mr. Poppelwell moved that they should get 2*d.* or 3*d.* less than they asked; it was put to the vote, and the larger sum was carried,

1239. (*Mr. Clayton.*) On the motion of Captain Purdo?—No, Mr. Poppelwell, I think.

1240. (*Mr. Webster.*) Be the fact as it may, it was proposed that the Corporation of Newcastle should get some 2*d.* or 3*d.* less than they now get, but they still continue to get it?—They still get the same price.

1241. And they make a profit, as ballast conveyors, out of the Conservators?—Precisely.

1242. In addition to this, is the present ballast system a considerable premium upon landowners making solid embankments?—No question of it. In a river where there is so much manufacturing industry, as in the Tyne, a good level site for manufactories adjoining the river is very valuable indeed, and if any landed proprietor can get a grant of a few acres of the river bed it is an excellent speculation.

1243. I believe there are considerable ballast heaps at South Shields?—Yes, they are on the land, however.

1244. Were those ballast heaps made under the licence of the Corporation?—Of course; in olden time, everything was under the licence of the Corporation.

1245. As a matter of fact, has there from time to time and from various circumstances, been rather more connexion between South Shields and the Corporation of Newcastle than between North Shields and the Corporation of Newcastle?—I should not like to give an opinion, as I am not a native of South Shields.

1246. However there are considerable ballast heaps at South Shields?—There are.

1247. I believe there are no ballast heaps at North Shields?—Not now.

1248. Have your Commissioners any idea as to the quantity of ballast which will be consumed by the Corporation, or the amount of profit which they will obtain if they should be allowed to continue to fill up that large enclosure, which is alleged to be the property of the Dean and Chapter, which they are now filling up?—I think there is a mistake about that; there is no ballast put into the Dean and Chapter's property at all, excepting a comparatively small portion at the west end, and the places opposite the Corporation property, I think, are as nearly as possible filled up already.

1249. The Corporation have already made most of the land?—I think they have made almost all that is to be got opposite their own estate.

1250. Have you formed any opinion as to the value of that land per acre?—I should say, as a manfacturer, that land of that kind, with deep water in front, was worth, at a low estimate, 30*l.* per acre per annum.

1251. I believe the high-water mark from the sea to Newcastle is very level?—I judge so, by all the surveys which I have seen.

1252. Have you, as Commissioners, any tide gauges or sufficient means of ascertaining the precise state of things as regards the level of the tides?—No. Mr. Comrie, in 1813, took a very careful series. I have never heard of any other tidal observations until those taken in 1849–50 by Mr. Calver, the Admiralty Surveyor, and also by Mr. Comrie again; but although I have repeatedly asked for them, I have never yet seen those tidal observations, which Mr. Comrie took in 1849, and which the Commissioners have paid for. I have seen some of them in a printed book, published in London in 1850, but the records themselves I have asked for over and over again and failed.

1253. By whom were those printed?—The book in which I saw them was by an engineer of the name of Beardmore.

1254. Not connected with this Inquiry?—Not at all; the Commissioners cannot get them, Mr. Beardmore can.

1255. Do you know what sum was paid to Mr. Rendel for his report and these observations; several thousand pounds, I believe?—Several thousand pounds.

1256. So far as you know, has any use been made of these from that time to the present?—I should say that no use has been made of that survey by Mr. Rendel.—I must qualify that; a copy of it has been lithographed from time to time for the Parliamentary plans, but his report of his tidal observations I have never seen.

1257. As regards the tidal observations that were taken by Mr. Comrie for Mr. Rendel, you have made application for them and have never been able to obtain them?—The only thing which I have seen which forms one part of Mr. Rendel's appendix to his report is a diagram of, I think, two tides of Mr. Comrie's.

1258. I presume that those which are called tidal diagrams would be very valuable documents with reference to this Inquiry?—They are very valuable documents at all times; the average is all that he gives in his report.

1259. As regards tide-gauges, have you procured any of those?—Yes. I think, after Captain Washington's Inquiry, in which he complained of the want of tide-gauges, the Corporation of Newcastle, then Conservators, purchased two self-registering tide-gauges; and I recommended the Commissioners to get them from the Corporation, which they did, and paid for them; and I have been frequently wishing them to be set up in the river, say, one at Newcastle, and another half way down, to correspond with the Trinity House tide-

J. C. Stevenson, Esq.

26th January 1855.

gauge at the low end of the harbour, so that we could tell whether there was any depression of the low-water level or not. But they are standing to this day; they have never been put up. One reply which I got from Mr. Brooks was, "When the piers are finished, one "will be put at the end of the north pier, and the other at the end of the south pier."

1260. Were you present when Captain Purdo read to the meeting of the Commissioners that statement of the tide observations which he had supposed he had obtained from the Newcastle Trinity House?—He read, on one occasion, what purported to be a series of depths on the bar, a comparison of some years back and 1850, or something of that kind. I did not pay particular attention to it.

1261. You remember the document being read?—Yes.

1262. I believe this showed a considerable decrease of water on the bar?—Yes.

1263. As between 1841 and 1850?—Yes.

1264. Do you know whether any explanation of that was ever offered by any of the Commissioners, or by Mr. Brooks?—The accuracy of the soundings was impugned. I did not know anything about it.

1265. With that exception of this statement having been read, showing this decrease in ten years, and the accuracy of the soundings having been impugned, you are not aware of anything having been done respecting them?—Until Captain Purdo lately asked that the Trinity House should be asked to furnish them.

1266. I think there was a little confusion yesterday in Captain Purdo's evidence as to the precise nature of the answer; I think you have it?—I remember it perfectly.

1267. Can you refer to the letter?—I have only a newspaper report, which by my memory is quite accurate.

1268. Just read it.—"A letter was read from the Trinity House, in reply to an appli-"cation, made on the motion of Captain Purdo, for pilots' records of the depths on the bar "for some years past. The Trinity House stated that their records, made since the "erection of the tide-gauge, might be inspected. Captain Purdo was not satisfied with "this, as these only showed the rise of the tides, not the depths; and he stated that he "would press for the annual average of the depths on the bar, which was most important "for the Commissioners to know. Mr. Rayne (an Elder Brother) said that it was not to "be expected that the Trinity House, who were at the expense of these observations, "should furnish them to the Commissioners, who might sound the bar themselves. "Besides, the observations had been so carelessly made as not to be trustworthy."

1269. Is that same Mr. Rayne who is an Elder Brother of the Trinity House, a member of the Corporation of Newcastle?—And a River Commissioner.

1270. We understand that Mr. Clayton, who is the clerk of the Commissioners, is also the Town Clerk of the Corporation?—Yes, he is, of course; every one knows that.

1271. That was a matter provided for in the Bill, which has been called a compromise?—Yes; it was one of those things which the promoters of the Shields Bill were obliged to submit to.

1272. Are there many instances in which the questions of the rights of the Corporation, so to speak, and the rights of the Coservators come into conflict, or ought to come into conflict?—Most distinctly.

1273. Hitherto have those matters, in your opinion, ever been properly dealt with? is there a question about the coal due, for instance?—Certainly, at the so-called compromise in 1850, the promoters of the Shields Bill wished the whole of the coal due to be transferred to the new Conservators; the Corporation of Newcastle claimed a part of it; it was arranged that three eighths should be transferred. Since then, there has been a good deal of discussion, as every one will know, with regard to the harbour charges in general, and Her Majesty's Commissioners for inquiring into local charges on shipping visited this neighbourhood in September twelvemonth, when Mr. Clayton appeared in defence of the coal due. Some of the Tyne Commissioners appeared there to argue that the coal due ought to be either abolished or transferred to the river. Since then these Royal Commissioners have reported that the remaining five eighths of this coal due ought to be transferred from the Corporation of Newcastle to the Conservators. The amount involved is 10,000*l.* a year, which would be a very seasonable addition to the River Commissioners' funds, of course at the expense of the Corporation of Newcastle. Of course, as clerk to the Commissioners, it is Mr. Clayton's duty to get possession of the 10,000*l.* a year; as Town Clerk of Newcastle, he will no doubt be doing his duty to the Corporation to do all he can to keep it.

1274. And probably a good number of the Commissioners are considerably interested in that subject?—All the Newcastle Commissioners being members of the Newcastle Corporation, are responsible to the ratepayers of that town, and I should certainly say that there is not that disinterested feeling abroad among the ratepayers of Newcastle which would approve of having this money spent upon the river instead of upon their own streets.

1275. Was this connexion of the representative of the Corporation and the representative of the Conservancy, and also of solicitor of landowners, the subject of consideration by the Tidal Harbour Commissioners in the case of the Dee?—I find the following statement in the report of the Tidal Harbour Commissioners in the case of the Dee.

1276. Is that the one when the present chairman was at the head of the Commission?—Yes; I understand so. It is the report on the Dee by Captain Washington and Mr. Godson, remarking how the Dee has been injured by the embankments of the River Dee Company, and by water taken from it by the Cheshire and Ellesmere Canal Company. They state,—"We may observe that it seems a singular arrangement that the same indi-

"vidual should have been solicitor to both the River Dee Company and the Canal Com-
"pany, and a proprietor in both, and at the same time should have been clerk to the River
"Dee Commissioners."

1277. One or two questions as to the application of the finances. I believe the accounts have been printed, and are presented in a detailed form to the Royal Commissioners?—Yes.

1278. Have you examined those?—I have been analyzing those accounts, and have the result here.

1279. What is the amount of revenue which you may call the available revenue?—The nominal revenue is about 19,000*l.*, but the sum spent in the first three years really upon river operations is only 17,000*l.*, the rest being salaries, harbour charges, law charges, interest of debt in building Newcastle Quay, and conveying ballast.

1280. What has been spent on dredging and improvements?—Under the head of dredging in the first three years there is 11,604*l.*, and under the head of river improvement in the three years, 5,643*l.*

1281. Of that which appears there under the head of "dredging," as 11,604*l.*, how much ought to go properly to making solid land?—Being satisfied that the work could be done for half the money if the Sunderland system was adopted, I put down half of that cost of dredging to land making.

1282. In the ballast conveying how much has been expended?—13,190*l.* in the three years.

1283. How much of that do you put down to making solid land?—Of that 5,626*l.* has been paid to parties who made land of it in front of their properties.

1284. Then, of 13,000*l.* spent on ballast conveying, 5,500*l.* has been paid to parties for land-making?—Yes.

1285. Of that 5,500*l.* paid to different parties, how much has been paid to the Corporation of Newcastle?—4,800*l.*

1286. And on that so paid there is a profit of from 600*l.* to 700*l.* a-year to the Corporation of Newcastle, as shown by their accounts?—Yes.

1287. Then out of this expenditure absorbed in dredging and ballast conveying, how much is due properly to river works as conservancy works?—Out of the 5,600*l.* under the head of river improvement account, 4,400*l.* has been for the embankments for making land.

1288. Leaving therefore what?—Leaving therefore, in the three years, about 1,200*l.* for other works.

1289. Then, with the exception of 1,200*l.* for other works, has the whole of the residue gone to what you call making solid land?—Certainly.

1290. In which the Conservators, when made, have no interest whatever?—Clearly.

1291. In this analysis of the accounts, is the Treasurer of the Commissioners the old Treasurer of the Corporation of Newcastle?—He was transferred, to use Mr. Clayton's own word, as an incubus on the new Conservators along with Mr. Clayton.

1292. Are the accounts which have been transferred with this gentleman, accounts in what you would call an old character, and to which you object in point of form?—The new Conservators just fell into all the antiquated anomalies of their predecessors, and the first year's accounts, I think, were not audited and published for at least eight months after the year closed. The fact is, that the worthy old treasurer has not the slightest notion of double entry, although he is, I believe, very accurate in his own way, and an accountant had to be employed. I must say that since then the accounts have been kept in the most unexceptionable way.

1293. I understand you to say that you object to the system which was transferred bodily from the old Corporation, and not to the conduct of any individuals themselves?—Clearly. It is a point in which the new Commission, instead of being an independent body, is still mixed up with the old Conservators.

1294. In your opinion, has the new Commission worked efficiently?—Certainly not.

1295. Has it been efficient for any other object than continuing the old system?—The most important works under the new Commission, the piers and the Hay Hole Docks, I have already said I have no objection to at all.

1296. But in reference to the Conservancy works generally, and those works not the subject of Parliamentary powers and Admiralty control, has the Commission worked efficiently except to keep the old system?—It is just as much as anything can be the old system continued all the same as before, as far as river works are concerned.

1297. Are the influences of Newcastle in the district very considerable,—the trading interests?—There is no doubt that those of the whole Tyne are very considerable,—they are of importance.

1298. Are the interests and the influence of Newcastle so considerable, that in your opinion the matter cannot be left in safety to local Commissioners without other control?—There ought to be a control on behalf of the public interests, which are at stake, because the River Tyne is not a private avenue to the town of Newcastle, but a public highway, and also to arbitrate between those points of disagreement which conflicting interests and conflicting views have given rise to, and had we had some Court of Appeal to settle those points upon which we have been disputing, the Commission would have been very much more efficient.

J. C. Stevenson, Esq.

26th January 1855.

1299. I believe all the present Shields Commissioners have expressed themselves in favour of either Admiralty or other control?—At some time or other I believe they have.

1300. If you had had this control of the Admiralty or some other body, do you apprehend that you would have had at this time a complete system of plans and river lines, up to which parties might advance their land, and beyond which they would not go?—We ought to have had that by this time certainly.

1301. Would such a system of plans have been a very important thing in the regulation and management of the Commission?—Of course, instead of fighting about first principles continually, and taking up what has been done in an isolated way, we should have been pursuing a straightforward plan, knowing beforehand what we were going to do, and what it was going to cost, and we should have had some idea of the future, which at present we certainly have not.

1302. Have you, in the conduct of the Commission, had any detailed estimates or plans and sections of the works which have being going on?—I would not say that we have never had that, but as a general rule, we have not, and I remember one particular case, it is a case above bridge, but it shows the principle as an illustration. There were some river works, altering some of the channels above Newcastle, to be adopted. The engineer made a formal report with the estimates; that report was not sustained, because it was thought to go too far, and he was to modify his plans, and get the estimate of the modification; his modified plan and estimate were never produced, the works were thought to be urgent, and I was outvoted at a meeting of the Commissioners, when I moved that the works should not be commenced until the plan and estimates were furnished, and until an arrangement was made with the landowners. The work was ordered to be proceeded with without any plan or estimate, and it was not long before the landowners interfered and put an end to the thing.

1303. Would the settlement of such a definite plan, with river walls, be of importance with reference to the questions of foreshore rights, which are constantly the subject of consideration before the Commissioners?—The whole thing must be settled by Parliament, or in some authoritative way, or else, of course, we never can go on.

1304. Assuming this plan, which Mr. Brooks has now produced as the plan which is laid before the Commissioners, to be the plan, does it afford you the information which you ought to have upon the foreshore questions?—No; there are no soundings upon it, it does not show the depth of water. I have frequently complained of his not giving us plans, showing not only the particular work in question, but the lines of the river on both sides, and above and below, so as to take a comprehensive view of it. Before I could get that done for the lines of the Hay Hole Dock, meeting after meeting I protested against Mr. Brooks bringing forward a single sheet of this plan, containing only the Hay Hole Dock, and nothing above or below, and it was sent up to the Admiralty in that state, and the Admiralty just sent it down, wanting the very thing that I had been driving at so long, so much so, that Mr. Brooks accused me of having been at the Admiralty, and having put it into their heads.

1305. Are you of opinion that it is necessary that there should be either some Parliamentary or other power with reference to these foreshore limits and foreshore questions?—Most decidedly. I maintain that it is an extraordinary thing, that a bare majority of this Commission should have the power in any case of alienating for ever from the bed of the river, which I maintain is a public freehold, any number of acres of land, perhaps by the casting vote of the Chairman, of alienating it so as never to be got back. Such extensive changes, which are now possible, as the fact stands, ought not to be possible, except with the consent of a higher power.

1306. Do you concur in opinion with this motion of which Mr. Allhusen gave notice, "That Parliamentary powers be applied for, with a view to obtain authority to apply the "proceeds of land to be taken from the river, for the benefit of the funds of the Tyne "Improvement Commission"?—I agree with the principle; I object to part of it: he contemplated the making of the land. Now, of course, the land should not be made at all; but if it be made, it should be a source of revenue to the river funds.

Cross-examined by Mr. Seymour.

1307. You have said a good deal about the shoal at Hebburn Quay. I want to know whether the dredger has been at all at work on Hebburn Shoal since the jetties were extended?—No.

1308. Not since the jetties were extended according to Mr. Brooks' view?—It has not been there lately; but it was there very shortly afterwards.

1309. Speaking of your own knowledge, do you know of any time that the dredging machine has been used there?—I must look up that report, upon which I found my information. I think not, excepting in widening about there. I have no record of that. I would not say. It may be; but I do not know.

1310. But you think not?—I should think not.

1311. You have spoken of the dredger being used at Coxlodge?—Yes.

1312. Where is that with reference to Hebburn Quay? how far down the river?—It is one of the first staiths.

1313. Is it half a mile?—I must look at the map.

1314. I ask you what distance is Coxlodge from Hebburn jetties? Is not the water

very deep at Coxlodge?—It is certainly very deep. It is widening that is wanted there.

1315. You said something about a notice being given to lessen the number of ships lying abreast?—Yes.

1316. Will you just point out upon the plan the spot to which that notice referred?—(*The Witness pointed out the same.*) In the narrow channel.

1317. You spoke generally about a public notice being given with regard to the moorings; can you point out the particular place?—It is along this deep narrow channel, north of the Cockcrow sand.

1318. Is it or is it not immediately under where Wallsend is written?—I cannot specify the locality any more distinctly; it is in that channel.

1319. What distance is that from the Hebburn quays?—Half a mile.

1320. You have said something about your consent being given to some temporary erection of jetties. Did the jetty to which you referred, at the west end of Hebburn Quay, as being lengthened 100 feet beyond the river line, receive the sanction of the Commissioners?—It received the sanction of the majority, certainly.

1321. Were you in that majority?—No. I was in the minority.

1322. Do you remember whether Captain Purdo was in the majority?—He was in the majority.

1323. You have spoken with reference to Messrs. Palmer's property, about the pencil line which was laid down on a map which was shown at the place. Are you quite sure who made that pencil line? was it not made by the Chairman of the Commissioners?—It was made by the group of Commissioners standing on the quay; the Chairman very likely was the man.

1324. Whose was the map upon which it was made?—The map belonged to Messrs. Palmer, who were making the application.

1325. The pencil line which, you say, was drawn upon the map at Messrs. Palmer's, was drawn upon a map belonging to Messrs. Palmer?—I understood so.

1326. You have mentioned several reports of Mr. Brooks'; can you tell me how many reports altogether you remember, from the beginning of the year 1850, and going up to the date of the last, as being presented by Mr. Brooks to the Commissioners upon the various subjects to which you have referred?—I cannot give you an answer.

1327. About how many?—I cannot form an estimate, even; it is impossible that any one can charge his memory. I may mention, that I moved long ago that all the Commissioners reports be entered in a book, and I do not think that has been done.

1328. However, besides the reports which you have mentioned, did not Mr. Brooks present several others?—No doubt.

1329. Without going into the matter of these reports, I shall take you to what you said with regard to Jarrow Slake.—I did not mention Jarrow Slake at all.

1330. I think you did; you said that your daily business was on the margin of it. May I ask you what that daily business is?—A chemical manufacturer.

1331. Have you not a great deal of refuse stuff connected with the manufactory to get rid of?—We have.

1332. Where have you been in the habit of disposing of that refuse stuff?—For some years we deposited it on the foreshore of the slake, but now we take it to sea.

1333. But did you, for some years, deposit it within the tidal flow?—We did.

1334. Did the deposit cover some three or four acres?—I think that would be the extent to which our deposit extended.

1335. (*Chairman.*) Of the slake?—Of the Jarrow Slake.

1336. (*Mr. Seymour.*) I ask you, whether the deposit was not within the tidal flow?—It was within the tidal flow; but it is proper to explain that it was carrying out a licence to enclose a part of the slake, which our landlords, under whom we hold these works, had obtained many years ago from the Corporation of Newcastle. A quay was built, and we filled up so much under the licence as they had not enclosed. But I may say that that is a good many years ago; and so far as it is brought out by way of charging me (I know the object of the thing perfectly well) with any inconsistency, in doing myself what I object to being done in a general system, we have done nothing to it since a period considerably before my attention was turned to these river matters at all.

1337. When did you cease to deposit this refuse matter there?—We have not put anything within the tidal flow for a good many years; I cannot give you the exact number.

1338. Can you say how lately?—I should say we have deposited none for four or five years.

1339. Would you say four or five, or three or four?—You may say four then, to the best of my recollection.

1340. Did you erect jetties at the request of the Commissioners at Jarrow Slake for the purpose of preventing this very stuff which you deposited being scoured away?—We did erect jetties, which they wished to be put up to make sure that none was scoured away.

1341. Has the stuff gone forward since towards the end of the jetties?—Not that I know of.

1342. Are you sure of that?—I have not looked at it for some time; it was not so the last time. We have not occupied the property in question lately.

1343. Have you seen those jetties lately?—I have not noticed them lately.

J. C. Stevenson, Esq.

26th January 1855.

1344. Have you been there?—No.

1345. Do you mean to say you do not know anything about it?—I mean to say that the last time I was there that state of affairs was not so.

1346. Can you say that it is not so now; that the stuff has not gone forward towards the end of the jetties?—I should be surprised if it had.

1347. You have talked of gales of wind and jetties: do not these jetties under these gales of wind sometimes get over the quay and interfere with this stuff? Can you say whether that has not been the case?—It has been the case.

1348. And has not a quantity of it been washed away into the river?—A quantity of it has been washed down to the bottom of the quay, and it has been there for a very long time past. It is hard material, which does not wash into the river.

1349. Is there a heavy run of freshes from that burn?—There is, but the stuff is not exposed to it.

1350. You say that you were acting under a licence, you came in under lease from Mr. Cookson, I believe?—We did.

1351. You said a great deal about landowners getting grants, and the benefit of them themselves. Did you ever think it necessary to make any explanation with regard to the exercise of that licence before the Commissioners?—Mr. Brooks has brought forward once or twice the same sort of thing as you are bringing forward now, and the thing was entered into and explained, and the Commissioners came down and saw the place, and I understood were satisfied.

1352. Do you mean to say that? Just let me ask you whether the Commissioners did not require you to remove it?—No.

1353. The Commissioners, I think, were at one time in London, when you undertook todo the work there yourself. You have spoken of unauthorized works; did you ever make a work at Jarrow Slake, which was not authorized by the Commissioners?—The cut referred to.

1354. What did you make?—We have done nothing since the Commission started, which has not been authorized by the Commissioners or their engineer.

1355. Did you not, when a number of the Commissioners and the engineer were in London, without authority, make a navigable cut up to your works through Jarrow Slake?—No.

1356. Was there a cut made?—A cut was made before the Commission started; it was in the time of the Corporation.

1357. Had you a licence to do it?—No; it was merely diverting the channel of a small stream, so as to pass through the slake at a different point from its former course; afterwards, that cut, with the consent of the Commissioners, was made navigable.

1358. However, without a licence from the Corporation, you made this cut?—Yes.

1359. Were the piles which you drove without a licence ordered to be drawn up?—The piles which we drove were driven with the knowledge and consent of the engineer; they were afterwards ordered to be withdrawn, but after that again they were allowed to remain.

1360. However, the piles which you had driven were withdrawn?—No, they were partly withdrawn, and the rest were allowed to remain.

1361. Are they not nearly all drawn?—They are nearly all away now, because they have been knocked down by accident, and not replaced.

1362. We have heard something of South Shields; did not the people of South Shields complain about those piles being driven there?—There was a memorial sent to the Commissioners by some shipowners of South Shields, upon a most ridiculous misunderstanding of the real facts of the case.

1363. Without its being ridiculous or not, at all events, was a memorial sent?—It was, complaining of these piles.

(*Mr. Webster.*) It had better be produced, if there was a memorial.

1364. (*Mr. Seymour.*) Was the memorial numerously signed?—Numerously, and respectably, too.

1365. Passing from Jarrow Slake, you have spoken of a visit to the river Ribble?—Yes.

1366. Have full-tide walls been brought into operation on the Ribble?—To a certain distance below the town of Preston they have, but below that again, they are considerably below high-water mark, and the extended walls lower down sanctioned by the late Ribble Navigation Act, are required to be kept very low indeed.

1367. I am asking now about the existing works?—The existing works I have described, are for about a mile below Preston, full tide.

1368. How much are the existing works below high-water at spring full tide?—Three or four feet.

1369. What is the rise of the tide?—Very considerable, but I do not know.

1370. Is it from 20 to 30 feet?—I should think it was. I may mention, however, that when those walls were laid down they were only half-tide, but in consequence of the great lowering of the bed of the river, of course, giving an increased range of tide, they came proportionably nearer high-water mark than they were before.

1371. Can you tell me whether the result of the erection of these walls has not been to reclaim a large quantity of land behind them?—A very large quantity of land has been reclaimed.

1372. Many hundred acres?—Many hundred acres—in consequence of the fixing of the

deep water in a single track, which formerly used to range about from side to side of a wide estuary, and keep a large mass of sand in a constant state of shifting.

1373. Can you state any reason why the same would not take place in the Tyne upon the same given facts—a fixed channel for instance?—As I have said already, the Tyne is not at present in the character of a channel ranging from side to side through masses of sand; it is a pretty uniform channel to begin with, it does not range from side to side, and does not keep a large quantity of sand in what I call an unnatural state of agitation.

1374. Before the jetties, you say it has not kept a large quantity of sand in an unnatural agitation?—Not at all, as it was kept in the Ribble; in the Ribble, the channel going from side to side, was alternately wasting the banks on each side, which, of course, is not the case in the Tyne.

1375. But you have attributed the result of the increase of land behind these walls to the fact that there were walls, and at the same time, a regular channel?—I attributed the silting up in the Ribble to the fixing of the channel.

1376. Have you seen any advertisements for the sale of land by the Commissioners of the Ribble?—We have heard of some similar advertisements here?—Yes. I am aware that by the Ribble Navigation Act of the Session before last, it was ordered that a survey should be made of the amount of lands already reclaimed, and compared with the survey which was made before the works commenced, that the accession of land so gained should be vested in the Ribble Navigation Company, and sold at its full value, fixed by arbitration, to the adjoining landowners, and the proceeds applied to the Ribble Navigation funds; and it is ordered also by the Act, that such a transaction is to take place every five years, I think, and the land so reclaimed is from time to time to be vested in the Navigation Company, and bought at its full value by the adjoining landowners.

1377. With regard to Mr. Rennie, do you approve of his plan of a south pier?—Mr. Rennie's south pier has been all along made the excuse for departing from Mr. Rennie's plan.

1378. I ask you that question; you can answer Yes or No?—I do not approve of it. I may say further, that Mr. Rennie's south pier has been made the excuse for departing from Mr. Rennie's general system of river management; but if Mr. Rennie's report is read carefully, you will see that he himself is quite aware of the objections to that south pier, causing the sea to range into the harbour, and he contemplates corrective measures. At the same time, it always appears to me a very paltry excuse for neglecting to attempt works for the improvement of the bar, as that particular pier has been made.

1379. Do you object to the Jarrow Docks, or approve of their formation?—I approve of the formation of the Jarrow Docks. I only objected to what I considered an unnecessary enclosure of land in addition to the docks.

1380. Are you aware that Mr. Calver has expressed himself very strongly in objection to docks at all?—No; I am not aware. I do not believe that he has.

1381. However, if he has, you do not agree with him?—If he has, I do not agree with him. You must have docks in the Tyne.

1382. You have said a good deal about the question of ballast and its position, and the price for its conveyance; what is the highest payment to the Corporation for ballast?—There is some of it at 10*d.* I think.

(*Mr. Clayton.*) It is 9*d.* to one place, 10*d.* to another.

1383. (*Mr. Seymour.*) 10*d.* is the highest?—Yes. At Walker they get 10*d.*

1384. Do you know any instances in which other parties receive more than the Corporation?—Certainly. Mr. Swinburn, at South Shields, receives 11½*d.*, and it is to be explained that he does not merely put it behind a wall and make land with it, but he has to put it into waggons and convey it by railway to a considerable distance across the land behind South Shields, and he deposits it on the sea coast; and he has to pay, I think, 2½*d.* deposit rent for the privilege of depositing it there; so that I consider that while Mr. Swinburn may have a pretty fair payment, the Corporation of Newcastle have a monstrous deal too much.

1385. You referred to the Sunderland ballast charges; do you remember a report being made to the Tyne Commissioners, by the Committee, of accounts of the cost of dredging, to which you were a party?—Yes; I was a party.

1386. Was that report in May 1852?—Yes.

1387. Do you remember the following passage in that report:—"Contrasting the "figure with the cost of dredging in the harbour of Sunderland, the superior economy of "the hopper system will be at once seen. In that port the average cost per ton for "raising and disposing of the dredgings was altogether 2·62 pence, or a little more than "2½*d.* for 1850 and 1851. But as this includes all the cost of repairs which should be "deducted, the working expenses in Sunderland appeaa to be 1¼*d.* against 5¾*d.* in the "Tyne, showing a difference of 4½*d.* per ton, which would amount to 1,500*l.* on the "quantity raised by the Commissioners' dredger last year." In 1852, were you a party to a report containing that passage?—Yes.

1388. Do you remember any proposal coming before the Commissioners to take the contract, in the event of their approving of it, for disposing of the ballast?—Not the dredged materials at all; no contract for taking dredged materials, that I remember, has come before the Commissioners.

1389. Has any proposition come before the Commissioners, if not as to dredged materials, with regard to disposing of ballast?—Yes; there was an offer made to the

J. C. Stevenson, Esq.

26th January 1855.

Commissioners by two gentlemen, of whom my brother was one (I know that is the point which you want to get out); they made an offer (I forget the sum) to convey ballast from Shields to sea in hopper barges. Nothing came of it; there was nothing done.

1390. Do you remember when the offer was made? Was the offer made on the 12th of October 1853?—Yes.

1391. At all events, some time after that report?—A year and a half, I should say.

1392. Did they offer to carry out the ballast to sea, by means of hopper barges, from ships in Shields Harbour, at the rate of 11*d.*,—that is to say 7*d.*, per ton, with permission to charge the ships 2*d.* per ton for filling, and 2*d.* per ton for lifting, making altogether 11*d.*?—Yes; these were the terms.

1393. Had you anything to do with that proposition yourself?—As being a Commissioner, I abstained. I had nothing whatever to do with it.

1394. However, that proposition was made?—It was.

1395. To whom was it made?—To the Commissioners.

1396. Are you sure it was made to the Commissioners, or was it made to the chairman of the Police Committee?—It was made to the chairman of the Ballast Committee.

1397. Are you a member of that?—Yes.

1398. Do you remember the proposition coming before the Ballast Committee?—Yes.

1399. Do you remember its being accepted?—No; I think it was declined.

1400. Was not it made to the chairman of the Ballast Committee?—I cannot say whether it was the chairman of the Ballast Committee or the chairman of the Commissioners.

1401. As you are a member of the Committee, did it come before the Committee?—Yes.

1402. Do you recollect, on the 12th October 1853, Mr. Ridley acting as chairman of the Committee?—I think I do.

1403. Was the following resolution come to:—"The Police and Ballast Committee "recommend the Commissioners to accept the annexed proposal for conveying ballast to "sea, and to grant Messrs. Stevenson and Company a licence to carry out their object, "subject to such regulations as the Committee may deem necessary from time to time?" —Yes.

1404. (*Mr. Armstrong.*) Then it was accepted by the Committee?—Yes.

1405. (*Mr. Seymour.*) You were present, you say, at that meeting?—I was.

1406. That was in 1853?—Yes.

1407. I need scarcely say that you have taken a very active part during the last two years in the particular views which you and Captain Purdo entertained on the Commission?—We have.

1408. In supporting these views, have you made considerable use of your position as a co-proprietor in the newspaper at Shields?—I have something to do with the newspaper at Shields, but I do not think it is a fair question to ask about the proprietorship; I may say I am not a proprietor of the newspaper.

1409. Has it not taken a very prominent part in some personal observations upon the proceedings of the Commission?—It has commented upon the proceedings of the Commission from time to time.

1410. With a good deal of personal feeling sometimes?—It is a matter of opinion.

(*Mr. Armstrong.*) We are all satisfied about that.

1411. (*Mr. Seymour.*) You spoke of Mr. Comrie having made certain soundings in 1849, were they made for Mr. Rendel?—Yes.

1412. Were not all these soundings at the engineer's office —Mr. Rendel's plan with the soundings was in the engineer's office; the tidal observations I referred to were not.

1413. Were not the tidal observations there too?—I mentioned that there was a diagram of two tides, but that the extended series of tidal observations which was taken, I understand, for many weeks together in 1849, I have frequently asked for and have never been able to get; it has been stated that they never have been got from Mr. Rendel, and I moved from time to time that they should be got; from time to time Mr. Clayton undertook to get them, and I have not seen them yet.

1414. Do you know that they are in the office?—I do not know whether they may be there now, I know they were not the last time I asked.

1415. Has Mr. Brooks ever told you that they were in the office?—No, never.

1416. Do you know whether your friend Captain Purdo has seen them?—He told me he had seen some observations, but whether they were those of Mr. Comrie I am not aware; at all events, if they are there they have come lately.

1417. You have referred to the tide gauges?—Yes.

1418. Was there not a tidal gauge at the Trinity House at the Low Lights, to which you might have referred, of the same construction as the gauges which you said you wished set up?—It was part of my wish that the Trinity tide gauge should be employed as one of the series, but everybody knows that you cannot make tidal observations from one tide gauge.

1419. However, there was a tidal gauge erected, belonging to the Trinity House?—Yes.

1420. To which you might have had access?—Of course; but one is of no use.

1421. Did you ever make a motion to erect another?—I am not aware that I brought it forward as a definite motion and put it to the vote, but I urged the thing till I was tired of making motions.

1422. But you made no specific motion?—I do not think I made any specific motion.

1423. In your opinion, is it more costly to raise ballast by the dredger, or to take it out of ships?—To take it out of ships, unquestionably.

1424. Is it not filled into tubs at the ballast engine at 1½*d.* a ton?—No; I think it costs more than that.

1425. How much more?—I think it is 2½.

1426. Have you any accurate information?—I am confident that it is 2½*d.*, as far as I can be confident.

1427. How do you think ballast can be carried out to sea in stormy weather in hopper barges?—You cannot take hopper barges to sea when the sea is breaking across the bar, of course.

1428. I believe the Act of Parliament requires you to take it two miles beyond the bar?—Yes; and in ten fathoms water.

1429. That will, of course, enter into the calculation of the cost?—Yes; but the real difficulty in stormy weather is in crossing the bar. The sea is always higher there. When once you are across the bar the additional distance is immaterial.

1430. Do you know where ballast is taken at Sunderland in winter?—Those parties who take ships' ballast in winter lay it upon a quay, and they take an opportunity in summer to take it to sea.

1431. You say the ballast is left upon the quay until the summer in Sunderland; does not dredging generally cease in Sunderland during the winter?—I think they sometimes dredge all the winter, but, of course, there is more interruption in winter, on account of the sea, than in summer.

1432. You told us that you are an alkali manufacturer?—Yes.

1433. Previously to your connexion with the Commission, have you had any opportunities of becoming acquainted with engineering more than you have told us?—I do not pretend to any engineering opinions as an engineer at all, of course.

Re-examined by Mr. Webster.

1434. As a matter of cost or a commercial speculation to take ballast out to sea, which is the more expensive, the taking ballast from ships or from dredging?—Taking ballast from ships is vastly more expensive. One reason is, that the cost per ton depends upon the quantity you can take. There are fixed expenses, which are the same whether the quantity taken is large or small. Now, in dredging, the hopper barge is laid alongside the dredging machine, the stuff is poured into it without ever being handled, and, calculating the cost upon the average of a year's cost, gives very different results in the one case from the other.

1435. Is there any other point in common, except merely the conveying hopper and the power to take it out?—There is nothing common except that; there is no parallel whatever in the matter of the expense.

1436. You have said that the only diagrams which you saw were diagrams of two tides?—Yes.

1437. Do you happen to know what two tides those were?—I can give you the tides; there was a spring tide and a neap tide.

1438. Do you know for what purpose they were obtained or used?—I have no doubt they were used by Mr. Rendel to enable him to form his opinion as to the amount of obstruction to the progress of the tidal wave, which the different features of the navigation presented.

1439. Can you tell me how it came to pass that only the diagrams of two tides out of a great number should have been selected or used?—I have no idea why those particular tides were selected; that was Mr. Rendel's doing, of course.

1440. Or was it Mr. Brooks' doing?—No; it was Mr. Rendel's altogether.

1441. I believe Mr. Clayton has these tidal diagrams now, has not he?—I should gather so from what I have heard.

(*Mr. Clayton.*) The engineer has them.

1442. (*Mr. Webster.*) In reference to the clause in the Ribble Company's Act about the reclaimed land becoming the property of the navigation, was that the same kind of arrangement as was contemplated in Mr. Allhusen's motion, which you expressed yourself as approving of?—I presume so. I understood so.

1443. (*Chairman.*) Do you not think that the improvement of the river has been much retarded by the disputes and litigation which have taken place between Newcastle and Shields?—I am quite of that opinion, that the energies which should have been spent upon the common good of the river have been spent in these local disputes.

1444. Do you think that it is very desirable these disputes should now cease?—It is desirable, no doubt, that the cause of those disputes should cease.

1445. Is it not very possible that by forgetting past differences a general plan might be arranged and steadily pursued by the Conservancy for the improvement of the river?—Merely forgetting things which still exist, is not the way to promote peace; it is to remove the causes of the want of harmony, and one of these is the hostile interests of the Corporation of Newcastle, which still commands a majority in the River Commission, with regard to several questions; the coal due, for instance, and the acquirement of land opposite their estates. It is impossible to forget those things while they still exist.

J. C. Stevenson, Esq.

26th January 1855.

1446. Are you aware that this Commission, in its report, can merely suggest changes which must afterwards be carried through Parliament with probably much expense and opposition?—I am aware that they can only recommend to the Legislature, the amount of opposition of course I cannot form an estimate of. The moral influence of the Commissioners' report might be so great as to prevent any opposition; I hope it will be.

1447. (*Captain Fitzroy.*) Is the existing arrangement for the management of river affairs, in your opinion, a fair and a just one?—I think it is of course an improvement upon the ancient state of matters; but if you refer to the constitution of the board, I am very decidedly of opinion that there should be an equal number of representatives from both ends of the river, with the power of appealing, in case of difference, to some independent central authority.

1448. Is there any possibility, under the present circumstances, of the interests of Shields obtaining due consideration in a body of which the majority are concerned in interests diametrically opposed to those of Shields?—It is, of course, to be supposed that the majority will act according to their interests.

1449. I ask if there is any probability, under those circumstances, the majority of the body being interested for Newcastle, that such a body can do fair justice to another constituency, that of Shields?—I think there is no probability until the balance of local interests is held by a superior authority.

1450. (*Mr. Brunel.*) You referred to a plan, which was subsequently produced, and which is on the table, which you recollect as the plan which has been produced at the meetings of the Commissioners; am I to understand you that that plan was unrolled and used really as a means of conveying information to the parties who discussed the merits of the question before them, and that it was the usual practice of the Commissioners so to use it?—The plan has been present at the meetings of the Commissioners; but I may state that this is the first time in my life that I have ever seen a plan of the Tyne at one view from end to end, except, perhaps, the first day that plan was laid out upon the table; but at the Commission meetings we never have the plans brought before us in the way in which they ought to be. Mr. Brooks comes up and unrolls so much of the plan as answers his purpose, and holds it before our faces, and points with his finger to what he proposes. That is not the kind of plan which we wished, and the plan which is used shows no soundings and no sections. The question of the transverse sections of the River Tyne, as affected by the works in progress, is a very important one, much more important than the mere question of depth, and that we have never brought before us in a satisfactory way.

1451. When this plan was so opened out partially, and not, as I agree with you would be much better to enable any body to form an opinion, opened out wholly, did you, with an inquiring mind, as you would naturally have, endeavour to have it unfolded, or how was it that that state of things continued for three or four years, and that those gentlemen who wished to procure information did not obtain it?—Of course that is not the only plan which I was dependent upon in making my own inquiries. I had for my own use a reduced copy of Mr. Calver's survey. I never brought forward, as a substantive motion, that the plan should always be produced at full length at every meeting.

1452. I merely ask you, whether you made any effort yourself to see the rest of the plan, which was so folded up as to conceal the greater part of it?—I do not impute any design of concealment.

1453. Did you make any effort to see it?—I turned it up when I wished it myself, of course.

1454. It seems to be a ground of complaint, and very possibly a very just ground of complaint, that you and others were not able to get the information which you required, and properly required at the Commission. That appears to be a specific allegation, and which may have materially affected the judgment which the Commission exercised in the progress of the works, and you mention as a case, that you did not see the plan; the plan was produced, and partially unrolled; you mention its only being partly unrolled as an instance of your not having the whole of the information. I merely ask you whether you made any effort whatever to unroll it and see the rest of the plan?—I always endeavoured to satisfy myself on these points, from the best sources of information which I had, but it is quite impossible, unless the engineer, of his own accord, brings forward those things in the way that we could wish, that we could by any mere resolutions of ours procure what we want.

1455. (*Mr. Seymour, through the Chairman.*) Has not that plan been used at every view of the Commissioners down the river?—It has always been brought to the views of the Commissioners.

1456. (*Chairman.*) You mean that you had full access to it at all your meetings?—Decidedly, to those who took the trouble to have it opened out.

1457. (*Mr. Brunel.*) Is the Commission to understand you, that you did not think it worth the trouble to have it folded out?—Certainly, I thought it worth the trouble, but I have not been pertinacious enough in insisting upon its being folded out.

1458. Am I to understand that any owner of land down the river, can either at once obtain a licence, or without a licence, is at liberty to receive ballast in front of his land?—No, he must have a licence from the River Commissioners.

1459. Then, the owner of frontage down the river, before he can have the ground

filled, even out to the river line, as settled by the Commissioners, must obtain permission from those Commissioners?—Yes.

1460. Does anybody, in practice, on a mere application, obtain that licence?—The only case in which a fresh balast licence has been granted to parties to deposit in the bed of the river, has been to Messrs. Palmer, which has been already mentioned.

1461. When you say a fresh licence, do you mean since 1850?—Yes.

1462. Generally speaking, are there many owners of frontage down the river from Newcastle to Shields, opposite to whose land there is still space to be filled up?—There are not many. There are only a very few large ones, the Dean and Chapter at Wallsend, the River Commissioners themselves have a property at Howdon, the present wall of which is within the line; and on the south side of the river Mr. Ellison's property is, I think, the only property such as you refer to.

1463. Between Hebburn Quay and Black Staith, is it all Mr. Ellison's?—It is all Mr. Ellison's.

1464. Then am I to understand that Mr. Ellison, and the Corporation, and the Dean and Chapter, own the great bulk of the frontage which yet remains to be filled out to the river line?—Yes, the great bulk of it.

1465. Has tha Duke of Northumberland any?—His frontage is mostly in the Hay Hole Dock.

1466. That may be considered as settled?—It is.

1467. When you say the bulk, does that form nine-tenths, or four-fifths, or what?—In the upper part of the river, above Bill Point, there is no question of encroachment of any consequence involved. The river is naturally narrow, and with steep banks. It is only below Bill Point that there is any question.

1468. Just above Bill Point there is some land?—Just above Bill Point, on the north side, belongs to the Corporation of Newcastle.

1469. From Bill Point downwards, does nine-tenths of the ground yet remaining to be filled out belong to one of those three parties?—I should say so, if not all of it.

1470. And has the whole of that land already got a licence for being filled out?—No; the licences spoken of are licences for the deposit of ballast. There is no licence, that I am aware of, referring to more than a very small portion of it as yet; only, if the same system is carried on, which has been hitherto pursued, it will all, ultimately, be filled up with ballast.

1471. You avow yourself an advocate of half-tide training walls and that the water should ever after be allowed to flow over those walls, and up to or nearly up to the old high-water mark?—That is what I mean.

1472. As a matter of business, and not at all as affecting any engineering question, is your view of the propriety of doing that influenced at all by the circumstance of the compensation which you might have to make to landowners who have that frontage; their frontage, I presume, would be injured by that?—The injury to a frontage is not of any moment except where there have been quays already existing on the shore, and for the greater part of Mr. Ellison's property, and of the Dean and Chapter's property, I think there are very few, if any, quays and manufactories at all along the high-water margin, so that no pratical injury would be done by putting a half-tide wall in front.

1473. However, whatever might be the amount of injury, about which, of course, there might or not be a difference of opinion, would not the water frontage of such land, and access to that water frontage, be materially affected, and injuriously affected, by the formation of a half-tide wall at some distance outside it?—Of course it would.

1474. Therefore such a system, whether it is good or not, as affecting the navigation, involves more or less the question of compensation for the frontage?—Clearly; and the compensation might be effected by putting viaducts over the mud bank between the high-water mark and the half-tide wall, and terminating at a wharf on piles by the water margin.

1475. That compensation might, in many cases down the river, amount to very large sums of money?—It might; but if the opinion is correct, that the maintenance of the lower reaches of the river depends upon the quantity of tidal water passing them, then that must take place whatever it cost.

1476. (*Mr. Webster, through the Chairman.*) Has not the question of the river lines always been a matter in discussion, or considered as unsettled by the Commissioners, and the subject of distinct committees? Was the question of river lines ever settled by the Commissioners at all?—That is a double question; the mere direction of the lines, where they should run, was not so difficult a question as the dispute as to the principle upon which they should be made; and the object of those who took our view of the case, was to put an arrest in the meantime upon the system which was going on of making full-tide walls, which never could be altered if our ideas should happen to be correct. We would have arrested their going on, in order to clear the way for a fair settlement, for whatever system might be most approved.

1477. Although this plan of Mr. Brooks' might have been produced from time to time, was it ever produced to any meeting of the Commissioners as the plan which Mr. Brooks was carrying out as a whole?—There is no plan which has been carried out as a whole.

1478. (*Mr. Seymour, through the Chairman.*) In the disposal of the mooring fund, did not the majority agree to lay out nearly the whole of the funds in Shields Harbour?—The mooring fund was nearly all laid out in Shields Harbour; but it is a tax upon the shipping.

J. C. Stevenson, Esq.

26th January 1855.

and was laid out where the largest number of vessels lay, and where it was most needed. I have no objection to the application of the mooring fund.

1479. (*Mr. Webster, through the Chairman.*) It was a distinct tax, was it not?—It was.

1480. (*Mr. Seymour, through the Chairman.*) It was a tax at the disposal of the Commissioners, and was so laid out?—Yes.

(*Mr. Webster.*) It was a modern tax under an Act of Parliament, for which the shipowners consented to tax themselves.

1481. (*Mr. Seymour, through the Chairman.*) The discretion of the Commissioners was used in laying it out where it was most wanted?—Yes, there was no choice whatever.

(*Mr. Webster.*) Sir, I have no other witness except Mr. Danson, the harbour-master, with the books, for which I got a summons.

(*Mr. Armstrong.*) You must direct our attention to something or other, showing the object which you had in calling for the books.

Mr. S. Danson.

Mr. Simon Danson, sworn.

Examined by Mr. Webster.

1482. You are the harbour-master of Newcastle?—I am.

1483. How long have you been so?—21 years.

1484. Do you produce books, containing a record of arrivals?—A list.

1485. To what period do they go back?—To 1848, I think.

1486. Is the earliest of your books 1848?—I think it is.

(*Mr. Webster.*) I am disappointed in that, as I was in the other matters, Sir.

1487. (*To the Witness*). The earliest book which you produce commences, I think, in November 1848?—Yes.

1488. Do these books contain the arrivals, and the draught of water of all vessels that come up?—No other part of the river than Newcastle Quay; these books were kept for the express purpose that no undue advantage might be taken of the ships' turns.

1489. They are turn books?—Yes.

1490. Do you remember when the Corporation had the first dredging machine?—I recollect it very well.

1491. When was that?—The first one which they had was a spoon one. I think that would be about 24 or 25 years ago.

1492. When had you the next?—The next was in the latter part of 1836.

1493. Was that a better one?—It was a steam one.

1494. Did you get another at any time?—We got another afterwards. We worked the first one a little while, and then she was laid by for some years, and then sold unfortunately at a loss.

1495. When was she sold?—I cannot say the year exactly.

1496. Under whose advice was it?—She belonged to the Corporation.

1497. Under whose advice was she sold?—I believe it was the engineer's advice.

1498. Who was the engineer then?—Mr. Brooks.

1499. Do you remember Mr. Brooks introducing his system of jetties?—I recollect it very well.

1500. Do you know whether that dredging machine was sold, because Mr. Brooks advised the Corporation of Newcastle that the dredging machines would be no longer required, because his jetties would answer all the purpose?—That was the case.

1501. As a matter of fact, have these jetties answered all the purpose?—I said from the first when they were put up, that they would do a great deal of harm to the river, and I told them exactly what they would do, that they would fill up the Bill Reach, and instead of draining the sand from Hebburn shoal, they have made it worse.

1502. In your opinion, the jetties, instead of doing good to the river, have made it worse?—No doubt of it.

1503. In your time, what was the first serious obstruction in the river?—The first that I recollect was the Tyne Main.

1504. What was the next below that?—The following one, Ellison Main was not so bad, the Hebburn Shoal happened to be the worst for a considerable time.

1505. Some twenty years ago, Hebburn Shoal was the first obstruction from the sea, was it not?—Yes.

1506. What is the first from the sea now?—Jarrow.

1507. Is that a considerable obstruction?—It has been very bad recently; but there has been one which has risen a little higher up.

1508. In your opinion has the channel generally become narrower lately, or broader?—It is considerably narrower; at present there is a little more water, but it is very narrow.

1509. To what do you attribute that? to the dredging or the jetties?—Everything that has been done to the river has been by the dredging; the jetties have been of no manner of use whatever.

1510. You say that the channel has become narrower?—Yes.

1511. How is it as regards depth generally?—When those jetties were put out at the east end of Hebburn Quay, the dredger commenced working, and as soon as the jetties were finished, the dredger was taken away, and the dredger made the water.

1512. Whether it was the dredger that made the water or the jetties that made the water, as a matter of fact, is what has been called the mid-channel, without reference to the breadth generally, deeper or shallower than it was?—A little better by dredging.

(*Mr. Webster.*) When I applied for these books, Sir, I thought there were records of a much earlier date.

(*Mr. Armstrong.*) You have no particular object about the books now.

(*Mr. Webster.*) No, Sir.

(*Chairman.*) Then they had better return into his charge than be placed in ours.

Cross-examined by Mr. Seymour.

1513. I believe you have been always of opinion opposed to Mr. Rennie's views?—I wish to see the river made a good river.

1514. Then you approve of Mr. Rennie's report?—I have seen it. I have said from the very first, that the jetties, if put up, would be a great injury.

1515. Have you not frequently expressed yourself dissatisfied with Mr. Rennie's views?—No, I cannot say that I have.

1516. How could the removal of Hebburn Shoal fill up the Bill Reach?—I did not say the shoal. I said the jetties had filled it up.

1517. But Hebburn Shoal has gone?—It is, both up and down, I have no doubt of it; in summer again it will appear in our river.

1518. Then you do not attribute it to Hebburn Shoal?—No.

1519. How far is Bill Reach from Hebburn Shoal?—Hebburn Shoal is the lower part of the reach; the Bill Reach is from Hebburn quay end up to Bill Point.

1520. Could you take a stick and point out the precise spot?—(*The witness pointed out the same.*)

1521. (*Chairman.*) Will you begin at the beginning, and point out the first shoal which you consider an important one. Point out first of all where the Tyne Main Shoal was?—(*The Witness pointed out the same.*) It was at St. Peter's.

1522. That is gone?—Partly so, but the sand does accumulate every year, more or less.

1523. It is comparatively removed?—It comes and goes; it is well adrift now.

1524. Where was the next shoal; was there one above Bill Point?—There was Walker sand.

1525. What has become of that?—That sand is partially lying there yet; there is a half-tide groin taken down on the opposite side. The sands generally move in the river; every spring tide makes an alteration in those sands.

1526. Is it better than it was in 1813, or is it still to the same extent that it was?—It is there still. The heavy freshes bring the sands down, and then the spring tides in summer take them up again, and there they lie.

1527. Is that as bad as it was?—I think the river now is better than it has been for some time.

1528. Do you think that that reach is better?—It is better.

1529. What has become of the Cockcrow Sand?—A great part of it has gone away with the last fresh.

1530. You get down now to Jarrow Sand?—There is Willington.

1531. Have you a sand there still?—Yes; there is a sand on the north side.

1532. Is it as great as it was?—It is worse. I have seen 16 feet there at low water, and now it is almost dry

1533. The channel is altered?—It is altered to the south side.

1534. There is still a channel?—Yes.

1535. Better or worse than it was before? How long ago do you remember the river?—I have known the river 36 or 37 years, almost.

1536. At the time of Mr. Rennie's survey in 1813, did you know it?—Yes.

1537. How is the Long Reach for navigation now?—It is a little flatter now than it was for some time.

1538. But as you recollect it 40 years ago?—It generally alters. It may be much about the same as it was 40 years ago. I cannot say exactly.

1539. You will not say whether it is better or worse?—No; it is shoal.

1540. Go on down.—Here is Jarrow Sand.

1541. Does that remain as it was before? is it better or worse?—It is the same at present, I think, as it has been for the last four or five years, or more; but I have known seven or eight tiers of ships lie down here afloat at low water: vessels of 10 and 11 and 12 feet, where there is nothing but sand.

1542. The lower part of the Long Reach is worse than it was?—A little.

1543. Now, with respect to the remainder?—This is the bar (*showing the same*).

1544. (*Captain Fitzroy.*) Do you know any reason for not having attempted to dredge the bar, to make the bar deeper?—It might be done very easily.

1545. Do you know any reason why it has not been done?—I do not; but I recollect myself about 19 years ago I took a steam boat down, and I got a set of boring rods and got some pilots with me, and went and bored on the bar. I bored 4 feet and 4½ in two places, and I did not come to any rock, or anything but sand. A swell came in and my apparatus gave way, or I might have got lower.

1546. Has any attempt been made to improve the entrance to the Narrows?—Yes; it

Mr. S. Danson.

26th January 1855.

has been at different times spoken of, and a diver went down there to a shoal lying there called the Stones.

1547. The Stones are outside the Narrows; but has any attempt been made to improve the Narrows themselves?—Not between the two points, but I have seen the point on the north and that on the south side gone away to a considerable extent.

1548. Have you ever heard any reason assigned for not making the Narrows wider?—I have not. I think the north side is a good protection to the harbour, and I think if that point was all dredged away, it would be a great injury to ships in that neighbourhood; it is a great shelter to them—it breaks the sea away—particularly away from the south-east.

1549. How many ships lie in Peggy's Hole?—We cannot have more than two at a time, because the range coming in, throws the ships over.

1550. Supposing the entrance were made wider, how many ships would be affected by it? how many berths would it injure?—If the middle ground were taken away we might have many more ships there; it is the middle ground which throws the ships all over to the north.

1551. If the middle ground were removed, and the Narrows made wider, how many ships as they now lie in Peggy's Hole and onwards would be affected by the sea thrown in by an easterly wind? how many berths would it make unsafe and bad?—There would be none unsafe for one ship lying in a tier, but if lying alongside each other they might do each other great injury by the motion.

1552. Will you oblige me with a distinct answer. Supposing the north side of the Narrows removed, or part of it, so as to make the Narrows wider, and the middle ground also removed, how many berths in Peggy's Hole and onwards westward would be injured by being more exposed to the sea thrown in by an east wind?—It might affect both the first, second, third, and fourth berths.

1553. Four berths?—Yes, I should say so, because I have seen the ships break their anchors even lying four berths up.

1554. How many hundred ships are there lying generally there, 800?—About 800, I think.

1555. Do you mean four tiers?—Yes.

1556. Containing in the outer part three or four ships in a tier?—Yes.

1557. About sixteen ships?—Yes, but we have not so much water there as we used to have.

1558. (*Mr. Webster, through the Chairman.*) I observe that your last entry is a ship consigned to Mr. Ormston, drawing 14½ feet?—Yes.

1559. Who is Mr. Ormston?—He is one of the Commissioners.

1560. Is there another 14½ feet ship in the whole book?—I dare say there may be; there was a Danish vessel which came up, I expect she is there; they wanted to bring her up, she was 15 feet water, and they lightened her and took part of the cargo forward.

1561. Do you happen to have an analysis of the number of ships during the period under 6 feet, 7 feet, and so on, showing the number of them which came up to Newcastle Quay?—No

1562. (*Mr. Seymour through the Chairman.*) Did not a ship, drawing 15 feet 6, come up to Newcastle Quay on Saturday?—14 feet 6; here is the captain's own hand-writing.

1563. (*Mr. Webster, through the Chairman.*) Consigned to Mr. Ormston the Commissioner?—Yes.

1564. (*Mr. Brunel.*) Where did she come up?—Close to the bridge.

1565. (*Mr. Seymour, through the Chairman.*) Have you an account of the Wentworth Beaumont, drawing 12 feet 11, coming up at neap tide?—She did come up on a very good neap tide.

1566. When was that?—The week before last.

1567. (*Mr Webster, through the Chairman.*) How was the wind?—The wind was from the eastward.

(*Mr. Webster.*) There is no other ship, I observe, in this list, that came up in January, drawing even as much as 12 feet.

(*Chairman.*) It is hardly worth while pursuing that.

(*Mr. Webster.*) Sir, this is the return of the low-water soundings in 1841 and 1848, which Captain Purdo referred to, as having received from the Newcastle Trinity House, the one read at a meeting of the Commissioners (*producing a paper*).

(*Chairman.*) How do you authenticate it?

(*Mr. Webster.*) It was the paper produced at a meeting of the Commissioners, as the state of things in 1841 and 1848.

(*Chairman.*) The other side do not oppose its reception, do they?

(*Mr. Webster.*) I bring it forward merely with this motive, that here was a document which was made use of, pointing out to you that there are really records of this, which may be got at if sufficient authority is used to get them. I can carry it no further. It purports to come from the Newcastle Trinity House, and was produced by Captain Purdo (and Mr. Stevenson spoke to it) at a meeting of the Commissioners, and was the subject of discussion. There was some confusion about it in his evidence yesterday. Mr. Stevenson cleared it up.

Mr. S. Danson.

26th January 1855.

(*Chairman.*) Might we not get it more authentically if we wrote to the Trinity House for it, than by taking an extract from a newspaper.

(*Mr. Webster.*) It is no doubt evidence, being a matter communicated to the Commissioners; the effect of it is a different matter. I would therefore suggest, Sir, that you should allow it to be entered, and if necessary, it can be authenticated by the proper officer.

(*Mr. Seymour.*) I would rather not be called upon to assent or dissent, it is a matter upon which I have no opportunity of cross-examining. I think in that shape, it is a bad precedent.

(*Chairman.*) We had better not receive it in that form.

(*Mr. Webster.*) Of course, Sir, if you think it material, you will issue your summons.

(*Chairman.*) You may apply for it at any time; we will summon the proper officer, and get it in the proper way.

(*Mr. Webster.*) Sir, as a minority, there is some limit to the extent to which those parties for whom I appear must go. I feel that I have done my duty in presenting to you every one of the gentlemen who made these charges which have led to this Commission, and I have given such other information as I could, not having the power which is possessed by others, because you are aware that, on a motion being made that the expense of this Inquiry, so far as regards the minority, should be treated in the same way as the expense of the majority; it was a matter which was united by the majority of the Commissioners. I may say, Sir, that Mr. Calver, the surveying officer of the Admiralty, is here, as a public servant; probably you would wish to examine him yourselves; if I can afford you any facility, I shall be very glad to examine him for you.

(*Chairman.*) You may cross-examine him at all events; you shall examine him for yourself.

(*Mr. Armstrong.*) I think we ought to call him, and ask you to examine him.

(*Mr. Webster.*) Exactly so, Sir. I consider that my duty to these gentlemen discharged at this stage, but I am here, of course, to afford you any facility which I can.

E. K. Calver, Esq. R.N.

EDWARD KILLWICK CALVER, Esquire, R.N., sworn, and examined.

1568. (*Mr. Webster.*) ARE you a surveying officer in the employment of the Admiralty?—I am.

1569. You attend here, I believe, in pursuance of instructions from the Admiralty?—I do.

1570. How long have you been engaged as a surveyor?—Since 1836 continuously.

1571. When were you first engaged in the Tyne?—In 1838.

1572. Did you survey the Tyne in that year?—My duty as assistant surveyor was to survey the shores of the Tyne at the entrance; to receive the soundings made by the party to whom soundings were entrusted in that survey; and to abstract the documents. That was my acquaintance with the nautical part of the Tyne in 1838.

1573. Did you again survey the Tyne in 1847?—I visited it in 1847 in common with other harbours on the east coast, to describe its features, for the purpose of a general sailing directory. I then remained a week, and made varions inquiries as to the particular character of the port.

1574. In 1849 did you examine it again?—In 1849 I was residing at Sunderland, and then the conservancy contest was commencing between Shields and Newcastle. On the application, as far as I remember, of the Shields people, they suggesting to the Admiralty that some independent officer of their own should be sent over to take certain testing sections upon the river Tyne, I was the party appointed for that purpose. The engineer on each side was directed to furnish me with a certain number of sections which they wished to be taken, and Captain Washington, who had been the Inspector, also suggested a certain number of sections. I took 16, pretty equally divided, between the lower part of the river and Newcastle, for the Newcastle engineer; 16 for the Shields engineer; and 19 for Captain Washington.

1575. At that time were you taking sections, such as were pointed out to you by the engineers of Newcastle and Shields, and by the Admiralty?—Yes.

1576. Did you also again examine the river in 1854?—In 1849; this was merely in the spring, to be a common check upon the statements on either side, being an independent person. I gave evidence upon that—that evidence was entirely in favour of the view taken by the engineer of the lower part of the river. When I made the sections, I did so with a view to make a comparison of the states of the river in the two periods of 1813 and 1849. Mr. Brooks, who was the engineer to the Corporation, selected his sections opposite his artificial works, imagining that my comparison was merely to be limited to the distance expressed by those artificial works, whereas that would only form one part of the comparison. I was forced to set against any gain which might have been formed by such contraction, any loss which might have followed from it as a direct consequence. When it was found that this was the only comparison which I would make, those sections were not called for, I think, by the Newcastle engineer, and I gave my general evidence; the purport of which was in favour of the view taken by the Shields people.

1577. Did those different sections enable you to ascertain and compare the transverse sectional areas as they then existed at different parts of the river?—As a mere rapid

E. K. Calver, Esq. R.N.

26th January 1855.

examination, it was sufficiently accurate; but immediately after that, I entered upon a legitimate survey. This was merely for operations in the spring, but when the Bill was lost, (as I understood, from the Session coming to a close,) on account of the contradictory statements which had been made, it was considered judicious, on the part of the Admiralty, that I should go down to the Tyne immediately after the Session ended, and make a complete survey of the whole river from the bar up to Newcastle Bridge, taking Mr. Rennie's survey as a basis. The plan of Mr. Rennie was very perfect; he had taken 286 sections between Shields Narrows and Newcastle Bridge; every section could be immediately identified. He had also fortunately left on record his datum, to which all his soundings referred; it was a certain notch in the south-west corner of the Low Light at Shields. I went to that corner, found the notch, carried it by levelling throughout the river, referred each of these 286 sections to the same datum line, proved what was the condition of the bed of the river in respect of this level as far as capacity was concerned, and upon that I made an elaborate comparison of the size and the navigable condition of the river. There were two distinct examinations in 1849; one only for a temporary purpose, in the spring, and the other was really an elaborate careful survey.

1578. In addition to these examinations in 1838, 1847, and two in 1849, have you also re-examined it in 1854?—I have partially re-examined it from Hayhill Point, opposite to, at that time, the proposed Jarrow Dock, to above Hebburn Quay, in June last. In addition to that, in the interim between 1849 and 1854, I visited it on one or two occasions to make reports upon works, or the probable effect of works.

1579. Did you examine and ascertain the quantity of solid land that was formed within the tidal basin since Mr. Rennie's time?—Yes.

1580. What did it amount to?—95 acres.

1581. Can you point out, on reference to the plan or otherwise, where most of that was situated?—Nearly the whole of the 95 acres are expressed by the black portions of that diagram. (*The Witness pointed out the same.*)

1582. That is, other than the red?—Other than the red.

1583. I believe that is land most if not all of which belongs to the Corporation of Newcastle?—I know nothing about the ownership.

1584. Do you know the names of the places at all?—I do.

1585. What are the names? is Willington Quay a part?—A considerable quantity of it. Cramlington Staiths, Willington New Quay, Wallsend, Walker, and the works that they term Walker Iron Works, just below Bill Point.

1586. Did you, from a comparison of sections, ascertain the quantity of tidal water entering the Tyne in Mr. Rennie's time, and according to your observations of 1849?—I did.

1587. What was the difference?—There was a loss upon a spring tide of 34,261,000 cubic feet.

1588. Was that each spring tide?—Below the datum of the surveys.

1589. That was the loss on each spring tide?—On a spring tide; if it were a smaller spring the loss would be in proportion.

1590. What did you find as regards the length of the sailing channel?—There was only 390 feet difference in the whole length of the channel between Shields Narrows and Newcastle Bridge. In 1813, the entire length, measuring from section to section very carefully, was 57,000,010 feet, and in 1849, 57,000,400, being practically the same.

1591. As regards the mean depth of the sailing channel, did you find any alteration in that?—Yes. I took in each of Mr. Rennie's sections the deepest water upon that section. I also took the deepest water upon my own sections, and the sum of all Mr. Rennie's was 7,143 feet, mine 6,957, showing a mean loss of 8 inches upon the deepest track of the river, the figures being 24 feet 4, and 25 feet.

1592. Did you at that time make any comparison of the width of the sailing channel at certain depths?—Yes; but I have not got it in this book. I have it here in great detail.

1593. Did you ascertain the first interruption in a four feet channel?—Yes. In the sailing channel of 1813, a vessel drawing four feet could proceed uninterruptedly from Shields Narrows up to Hebburn Quay, 28,000 feet within the bar, without meeting any impediment. When I made the survey, the same vessel drawing four feet would be interrupted at the lower part of Jarrow Slake, upon that spot marked in black at the lower corner of Jarrow Quay. In 1813, a vessel of four feet would sail along the Tyne to this green mark, where she would be first interrupted; and in 1849, the same vessel would be interrupted here (*showing the same*).

1594. Where were the principal isolated banks which were dry at low water?—The principal detached shoals are by name, the Insand, Durtwich, Jarrow Sand, Cockcrow and Walker; they are principally detached sands, lying in the middle of the river. In Mr. Rennie's time they amounted to 99 acres; in 1849 they amounted to 104, being five acres more.

1595. Did you compare the low-water area in Mr. Rennie's time and in 1849?—Every section was calculated; there were 286 low-water sections.

1596. But the surface—it arises in Mr. Rennie's report in this way:—"By the line of "jetties laid down by me the surface of the channel, supposing the tide to be confined "within these points, will be reduced to about 896 acres, namely, 448 acres less "than it now is at high water." Therefore that gives you the high-water area in Mr. Rennie's time?—I do not immediately understand your question.

1597. This statement, in Mr. Rennie's report, would give you the surface of water at high water, would it not?—Yes; I can measure the surveys.

1598. Have you any means of comparing the amount of low-water surface at the period of Mr. Rennie and in 1848 or 1849?—No; I can give that at another time.

1599. As regards the depth and breadth of Shields Harbour, what did you find there?—North Shields Harbour, from the Narrows to the New Quay, which is in fact all North Shields Harbour, had decreased 34 feet in breadth and 2 feet 11 in depth.

1600. Is there a part which you call properly the throat of the port?—The part to which I have applied that name is the part of the navigable channel between the Middle Ground, or the continuation of the Insand and the Low Light beach, where one of the Royal Commissioners was examining.

1601. Has there been any alteration there?—I thought, as an index of quantity, it was useful, and I measured the navigable channel there at low-water. Mr. Rennie's 12 feet channel was 115 feet broad, in 1849 it was 82 feet. Mr. Rennie's 9 feet channel was 210 feet, in 1849 it was 123 feet; his 6 feet channel was 300 feet, in 1849 it was 167 feet. The 3 feet channel in Mr. Rennie's time was 580 feet, in 1849 it was 570 feet, being practically the same, taking the surface; but the gorge of the navigable channel had deca d, taking it as a whole, from 30 to 40 per cent. at low-water time.

1602. (*Captain Fitzroy.*) The sections to which you have referred having contracted in width, is the depth the same in each case, or greater or less. I allude to the section to which you referred, particularly in the Narows. The Narrows having become more contracted in width, has there been at the same time an increase of depth or a continuance of the same depth?—That I cannot immediately give, for this reason; when I measured the breadth from the point of the Middle Ground to the Low Light beach, I did not go upon Mr. Rennie's sections, but upon the contours by his sections. The way in which I got the capacity of the throat of the port was not by measuring by the sections, because they would not cut across; the throat of the port might be between the two sections.

1603. Then the comparison is of no value, because it only shows the surface?—Not in that way.

1604. (*Mr. Webster.*) What did you find the alteration in the low-water capacity of what you call the throat of the port?—A decrease of 30 to 40 per cent.

1605. What did you find as regards the depth of water upon the bar?—The bar in Mr. Rennie's time was 6 feet deep; in the Admiralty survey it was 6 feet 8, being an increase of 8 inches as regards depth.

1606. Now as regards the sectional capacity for the sailing channel?—Taking it on each side at low water from 3 feet to 3 feet, the sectional capacity was 9,775 square feet in Mr. Rennie's time, 7,560 in 1849, being a decrease of nearly a quarter part.

1607. A quarter part of that which you call sectional capacity of the sailing channel over the bar?—Yes; taking the whole capacity over the bar, it was a quarter less.

1608. Was your attention called to some old plans of 1771, and 1782, and 1800?—I saw them during the Conservancy contest.

1609. What was the depth of water shown by them upon the bar?—I saw old plans of the dates of 1771, 1782, and 1800, and the average depth of the bar was 8 feet 6 inches. In the Admiralty survey, on which I was engaged in 1838, the depth was 8 feet 3 inches.

1610. So far as depth was concerned it had been deeper than in Mr. Rennie's time, and was again approaching to the original depth?—Yes; I may mention here that there must be an explanation of this. The depth in the Admiralty survey is a more valuable record than that upon the old plans. You cannot rely upon these old plans, they generally do not give any datum to which they refer, but the Admiralty survey had Mr. Rennie's datum, and is so far valuable as a correct comparison.

1611. I believe it is stated by Mr. Brooks in one of his reports, that in 1845 there was usually found over the bar in low water spring from 8 to 9 feet; is that consistent with your observations and experience?—No; I have seen such a report, stating that on the bar of the Tyne at low water spring tides there is a depth of from 8 to 9 feet.

1612. (*Mr. Armstrong.*) 8 feet 6 I think you made the depth?—The average depth of the three old plans, which I mentioned was 8 feet 6, and I made it in 1849 6 feet 8. In Mr. Rennie's time it was 6 feet, and in the Admiralty survey of 1849, 6 feet 8; in the old plans and the Admiralty survey 8 feet 6 and 8 feet 3.

1613. (*Mr. Webster.*) In June 1854, to what part of the river was your examination principally confined?—From Hay Hill Point to the upper part of Hebburn Quay.

1614. What did you find as regards the general condition of the navigable channel compared with what had it been in 1849?—I found it in a distinctly inferior condition as a navigation.

1615. Did you find the dredger at work upon a shoal which you had not known to exist in 1849?—The dredger at the time of my survey in June last was working upon a shoal which did not exist in the Admiralty survey of 1849, and which was a fresh interruption to the main navigable channel of the river.

1616. Where was that?—(*The Witness pointed out the same.*) The character of the shoal was a weir of sand, stretching from this mass opposite Jarrow Quay to Willington. The spot to which I refer is above Howdon Dock. It goes diagonally across the bed of the river to opposite Willington Quay. I may here, perhaps, make one remark. Upon the inspection of the river the other day, when I had the honour to go down the river with the Commis-

E. K. Calver, Esq. R.N.

26th January 1855.

sioners, I did not intend in a casual visit of the sort to ask for any particular examination, knowing how impossible it is to do it correctly. When we got down to Black Staith certain soundings were being taken. The boat was traversed from side to side in the channel, and the Royal Commissioners attention was drawn to the state of the channel. These diagrams are intended to represent the shape of the four-feet channel, the main navigation of the Tyne at the three periods of 1813, 1849, and 1854, in each case, the blue showing the navigable channel, the black figures showing the low-water depth. This is the river of 1854 (*the lower diagram*). When the Royal Commissioners got down to this point, the steamer in which they were embarked was put from side to side of the channel to draw the attention of the Royal Commissioners to the beautiful channel which existed there. If you look to the similar channel in Mr. Rennie's time you will, as a matter of comparison, at any rate, not find an inferior channel. If you remember, I then felt it my duty to ask you to let the soundings be continued a little further. We then resumed about here. The master of the steamer was desired to keep to the navigable track of the river. He came from this part of the deep navigation over that shoal which did not exist in 1849, and here the examination ceased. I merely wanted to be conveyed along that track to prove, beyond cavil, the existence of this weir at the present time. That was the channel of 1813, without a single break in it. This is the channel of 1849, and this is the channel of 1854; and when I was making my examination in June last the dredger was at work at this spot.

1617. That was a spot which had not existed before?—Yes; it is not a mere spot, it is a large feature in the navigable channel of the river; it is not a mere casual obstruction, it is an altered condition of the bed of the Tyne.

1618. As regards the breadth of the river at Hebburn Quay, did you find that it had varied in any way?—Yes; the following works had been introduced: these are transverse wooden groynes above the quay, existing in the survey of 1849; since the survey this groyne has been lengthened 60 feet, this 100 feet, and these two groynes, contracting the the breadth of the river by one third, have been erected. The effect of the contraction, namely, the increased scourage over the remaining space, has in fact removed Hebburn Shoal as an obstruction to the navigation. But that is not the only direct effect of these works; the whole of the navigable channel of the river is narrowed an average breadth of 40 feet from Headon Ballast Quay to the lower part of Jarrow Quay, while the additional sand thrown on to the Cockcrow would more than account for the extra scourage out of this channel. The projection caused by the protrusion of these groynes has deflected the current over to the south shore, and thrown the property at Willington Quay into permanent shoal water, as the direct effect of introducing the groynes at Hebburn Quay; and also the feature to which I have been alluding as a new feature in the bed of the Tyne since the Admiralty survey, I may say is the direct effect of the projection of this point.

1619. Then you found that the depth of water over that shoal had increased?—That it had increased 1 foot 10 inches at Hebburn Shoal.

1620. But the breadth of the sailing channel was diminished?—The breadth of the sailing channel was diminished 40 feet from a little distance below Headon Ballast Quay down to the lower part of Jarrow Quay.

1621. (*Mr. Brunel.*) Since 1849?—Yes.

1622. (*Mr. Webster.*) Were there notices affixed at any part of the staith ends, from the harbour-master as regards the number of vessels that might lie there?—I observed a confirmation of the correctness of my examination in the shape of notices from the harbour-master, attached to the ends of the staiths in that part, warning vessels not to lie more than two abreast, I think in consequence of the narrowness of the channel abreast of them.

1623. As to a comparison of the state of the bar in June 1854 and in 1849, how did you find it?—I made an examination sufficient to satisfy myself as to the depth over it, to enable me to give evidence before the House of Lords.

1624. Was that on the occasion of the Jarrow Dock Bill?—Yes that was the cause of my being here in June 1854.

1625. What did you find the depth to be?—I went out on June the 14th, when the water was very smooth. I waited till the tidal flow had been received at the tide-gauge at Shields, when I commenced to sound the bar. I found the deepest track over the general level of the crest of the bar to be 6 feet 8 inches, the same as the Admiralty survey of 1849, and the breadth very nearly the same. When I got up to London to give evidence, among other documents supplied to me was this diagram, signed by Mr. Brooks, and supplied by him to the Admiralty, on which appears a bar of 24 feet at high-water springs, and the Admiralty survey is put down above it as 21 feet 8, implying that between the time of my survey of 1849 and 1854, the bar had deepened to that extent from 21 feet 8 to 24 feet. I made an examination sufficient to satisfy myself that the bar was 21 feet 8, exactly the same as to depth as in the Admiralty survey, and the breadth the same; but when I got up to London I found this document as evidence to show that there was 24 feet at that time. As I find that there are some pilot's depths over the bar, which must have been taken about that time, I just ask the Royal Commission to allow that book to be referred to, in order to see to a certain extent which it confirms.

1626. On June the 12th I observe this entry in the pilot's book, in the column "Depth "at low water, 7 feet;" "Rise of tide, 16 feet;" "Bar as per marks, same;" I suppose that means one foot more, being the entry in the line above. The depth on the bar was 23 feet, with a 16 feet lift.—But there was a 15 feet lift. I only allow a 15 feet lift at

the bar when I say 21 feet 8, the same as is allowed in the Admiralty survey; referring everything to Mr. Rennie's datum, in fact carrying Mr. Rennie's line out to the bar, and the bar in the Admiralty survey of 1849 was 21 feet 8 below that line.

1627. Then your evidence, as I understand, is, that the bar, as sounded by you on the 14th of June, had 21 feet 8 upon it?—It had.

1628. And the entry in the pilot's book of June 12th would be 22 feet?—Yes. I was not aware of that, but I thought it would be a satisfaction to my own mind to see which it confirmed.

(*Captain Fitzroy.*) Within a few days of the same date the bar had 24 feet on it according to the pilot's statement.

(*Mr. Brunel.*) But you must take the lift of tide corresponding to that on that day.

(*Captain Fitzroy.*) I am comparing the result: 24 feet, 23 feet, 22 feet, 22 feet 8, 23 feet, 21 feet 6. They are very irregular: 23 feet, 20 feet 6, 20 feet 2, 22 feet, 22 feet, 20 feet 8, and 22 feet 8.

(*Mr. Brunel.*) It is not irregularity of the bar, but the tide.

(*Captain Fitzroy.*) I am speaking of the depth of water on the bar, and that is what is marked on that document, the depth of water on the bar on a certain day. I observe stress is laid upon the fact, that there is a difference of a foot or two between the plan and the pilot's book on that particular day; but it appears that some of the days do not agree in that within a couple of feet.

(*Mr. Calver.*) I would rather have the pilot's depth at low water, because I can apply to that my 15 feet of the datum line.

1629. (*Mr. Amstrong.*) There are the three on the same day—yours, and the pilot's, and Mr. Brooks?—Mine is the 14th June, and the bar does not vary materially; it is a broad flat bar, and has an even depth.

1630. (*Mr. Webster*). There are two feet difference; comparing your observations with the result that the pilot book would give, when referred to the same datum, does the pilot book show a depth of 22 feet on the bar on the 12th of June?—The pilot's book is with a 16 feet rise of tide, but I allow 15 feet rise of tide; it is not exactly the same comparison; it is sufficient for me that it is 7 feet at low water; it is merely a question of fact how far the bar was at that time below a certain datum line. Of course, it is not an absolute spot, and is not varying like high water. I merely say, that I see here that the Pilot's Book gives 22 feet; mine gives 21 feet 8 inches.

1631. These entries are consecutive fortnights?—They are; but in the middle of the summer, the bar does not vary at all. The only object in my drawing attention to this is to see into the reason of this discrepancy as to a matter of fact. I invite a little inquiry into it, because when I got up to London to give evidence, I found that that bar, which I was prepared to say was 21 feet 8 inches below Mr. Rennie's datum, was in that document 24 feet.

1632. That upper plan, as I understand you, shows in different colours the different states of encroachment at different periods?—Yes.

1633. What is the fresh red?—The deep red of the upper diagram represents the fresh lands made since 1849.

1634. Will you have the goodness to read from it?—The deep pink of the diagram represents the additional land formed within Mr. Rennie's tidal basin since 1849; the black from 1813 to 1849, the deep pink from 1849 to 1854.

1635. Have you compared the acreage of those portions at all? Have you ascertained the acreage of those different colours represented there? You gave us the black solid land since Mr. Rennie's time, up to 1849, at 95 acres, I think? Can you give the Commissioners the acreage of the other portions in any way?—Speaking from memory, I think it was 34 acres in addition to the 95. Possibly I gave evidence before the Lords about it.

(*Mr. Brunel.*) I should like to ask the learned Counsel on the other side, whether he could, without detriment to his view of laying his case before the Commission, commence with the engineering evidence which he proposes to bring, because it will be almost impossible for me to be here next week?

(*Mr. Seymour.*) So far as I am concerned, Sir, I cheerfully consent to that. Will Mr. Calver show me his survey?

(*Mr. Calver.*) I have no regular survey of the bar. I ran a number of sections across it sufficient to satisfy myself of the general level of the bar, to institute a comparison with the Admiralty survey in 1849. I adopted all the precautions necessary, but I have no legitimate survey.

1636. (*Chairman.*) You can show what you have?—Certainly. I can have no objection at all to supply that.

Adjourned till to-morrow, at 10 o'clock.

Saturday, 27th January 1855.

E. K. Calver, Esq., R.N.

27th January 1855.

EDWARD KILLWICK CALVER, Esquire, R.N., further examined.

1637. (*Mr. Seymour.*) YOU stated, I think, yesterday, that you found upon comparison between the years 1849 and 1813 that the loss upon the spring tide, as compared with Mr. Rennie's estimate at high water, was 34,261,000 cubic feet. I want to know by what process you arrive at that calculation?—I stated yesterday that Mr. Rennie had 286 transverse sections between Shields Narrows and Newcastle Bridge. In my survey, in every instance I identified the position of each section, and re-sounded them, using the 15-feet dead level of Mr. Rennie carried throughout the river to refer the bed of the river of 1849 to. In consequence of this, each section became a distinct point of comparison. That enabled me to calculate the difference of the river, considered simply as a receiver between 1813 and 1849. The result of a comparison of the sections showed that the river, simply as a receiver for tidal water, had decreased one twenty-second part in capacity. Then I took Mr. Rennie's report, and in his report you will find he states that on May 31st 1813 there were 726,621,000 cubic feet of tidal water admitted into the Tyne; one twenty-second part of that was 34,261,000. Mr. Rennie's report was the only thing I had before me, and it was the only comparison I could make. If Mr. Rennie's calculations had been before me to tell me how he got the 726,000,000, it would have been a little more satisfactory. I should have seen exactly the nature of his calculations in determining the tidal contents; but that not being in existence I could merely treat the river as a simple receiver, and the reduction of its capacity as a receiver, I applied immediately to the reduction of tidal water.

1638. Did you base your calculation on the supposition that the tidal receptacle was filled at the same time at the bar and at Newcastle?—Certainly not; no tidal receptacle is full at the same time. It is impossible. The veriest tyro in such matters knows that. I merely assumed that on account of Mr. Rennie's celebrity as an engineer, he would make a proper calculation of the amount of tidal water admitted into the river. He has stated that on the 31st of May 1813 he had made the calculation, and it was evidently the safest plan for me, simply wishing to arrive at the fact of comparative size, to assume that he made that calculation correctly; and I then applied the reduction of one twenty-second part of it.

1639. Then you did not base your calculation upon the supposition that the tidal receptacle was filled towards the bar, and towards Newcastle at the same time?—My calculation had nothing whatever to do with such an idea; it is a thing which cannot exist in nature.

1640. As a point of fact, do you not know that it is something like an hour and a quarter high water at the bar, behind the time it is at Newcastle?—The time of high water on an average spring tide at Newcastle Quay, after Prior's Rock, which is a little outside of Shields Narrows, is one hour and three minutes by my observations, and also by Mr. Brooks's. Therefore that shows you that the receiver cannot be full at the same time.

1641. Your calculation upon this matter has been disputed by Mr. Brooks, has it not?—It has.

1642. Has he not published the grounds upon which he disputes the accuracy of your calculation upon this point?—He has.

1643. Have you seen a pamphlet, entitled the "Reply of Mr. Brooks" to your letter to the Commissioners in 1852?—I have. I addressed a letter to correct the misrepresentation.

1644. In that letter you assert the same loss?—The same as I have asserted now, of course.

1645. Do you remember this passage. Mr. Brooks charges you with having based your calculation on the supposition that the tidal receptacle is filled at the same instant of time, does he not?—If you will allow me, I will look.

(*Mr. Webster.*) Perhaps you will put it in, and then we shall have the two cases.

1646. (*Mr. Seymour.*) Yes. "Next, as to the intelligence displayed by that gentleman in "making his calculation on the supposition that the tidal receptacle is filled at the same "instant of time. His own tidal section on his chart shows that this is not the fact. He "must know, that when it is high water on the bar, it is only just beginning to flow at "Stella. So, here again is an error committed by him of many scores of millions of cubic "feet. I have, as yet, only given his errors above the surface of the river at the instant of "high water on the bar, and have now to call your attention to the fact, that he has fallen "into another heavy mistake, also involving an error of other scores of millions of cubic "feet, by calculating his contents of tidal water from the level of low water at each station, "when the river is at its lowest state. This can only be correct on the bar, because at "every other station the time of low water is later than on the bar. Thus, at the instant "of first of flood on the bar of the 15th September 1848, when the water stood at 16 feet "9½ inches below datum, it was 8 feet 9 inches below datum at Newcastle, 7 feet 3 inches "at Elswick, 5 feet 9 inches at Stella, and 3 feet 11 inches below datum at Newburn." He proceeds, "In calculating the cubical contents of this tide of the 15th, according to "Mr. Calver's erroneous mode, he would, for the Newcastle height, have taken the actual "rise and fall on that day of 11 feet 3 inches, in lieu of deducting from that height 2 feet

" for the part not filled at the instant of high water on the bar." Did you deduct, in making your calculation, 2 feet for the part not filled at the instant of high water on the bar?—I perfectly remember this explanation of Mr. Brooks respecting my calculation; but the explanation has no connexion whatever with the calculation which I made. Mr. Brooks assumes all this. If Mr. Brooks is able here, before the Royal Commissioners, to point out any evidence of mine to say that that is the system which I adopted, I am perfectly ready to admit it. I deny the whole of it. My calculation, of course, is open to all. I am ready to explain it to the Royal Commissioners; this has really no connexion with it; it is a mere assumption.

1647. In making your calculations, did you, or did you not, make any deduction for the part not filled at the instant of high water on the bar?—In making a comparison, I had merely Mr. Rennie's statement, that on a certain day, a certain amount of tidal water was received. If I had had Mr. Rennie's calculations before me, telling me exactly what instant of the tide he calculated for, I should have immediately adopted Mr. Rennie's system, and made a similar calculation. I assume that Mr. Rennie, an eminent engineer, would take one period of the tide when he considered that that receiver was fullest, and make his calculations accordingly; still, in the absence of that, I was forced to assume that he made a correct calculation of the tidal water admitted. The only way that I could establish anything like a comparison as to contents, which is really one of the most important things, was to treat it simply as a receiver, and finding that the receiver had decreased one twenty-second part, the only mode I could adopt was to say that the contents of tidal-water had decreased one twenty-second part; it is the only comparison that can be made.

(*Mr. Armstrong.*) The assumption which you make is, that Mr. Rennie took the same state of tide exactly as you did.

1648. (*Mr. Brunel.*) You assumed that Mr. Rennie had made the necessary deductions for the effect of the tidal wave?—Quite so.

1649. You did not make the deduction, because you took Mr. Rennie's figures after he had made, as you assumed, the necessary deduction?—Yes.

1650. (*Mr. Seymour.*) In point of fact, you cannot, of your own knowledge, say whether the deduction was made or not?—I may just remark, before I answer that question, that it is now five years ago, and I was extremely careful, as it was such an important thing, to use every precaution, so as not to misinform in giving this comparison.

1651. If your evidence amounts to anything, I must take it for this, that so far as your own knowledge extends, you do not know whether you made the deduction or not; you assumed Mr. Rennie's report to be true, and took it upon that assumption, but you do not know yourself whether you made the deduction or not?—If I had ventured to predict the mode of his calculation, it would have led me into error.

1652. Do you know, in point of fact, whether in making out your calculation, you allowed for this deduction or not?—I assumed that Mr. Rennie made the deduction; it was not for me to make the deduction. I assumed that Mr. Rennie understood his business in calculating the tidal contents, and my business was simply to make a comparison with Mr. Rennie's tidal contents.

1653. If you assume a thing which is not in your own knowledge and experience, merely upon the report of another man, I presume, you cannot say whether it is so or not?—I assume his calculation to have been correct.

1654. (*Mr. Armstrong.*) Am I to understand you to say that, in point of fact, you did not make these deductions, assuming that Mr. Rennie had made them?—Quite so. It is a very important point, and I am willing to give every information.

1655. (*Mr. Seymour.*) Knowing that the time of high water is so different, do you not think it would have been important for you to have ascertained that fact before you relied upon the correctness of it?—I say it was distinctly necessary for Mr. Rennie, in calculating the total contents, to do it.

1656. But was it not necessary for yourself?—No.

1657. I suppose the same answer applies to any deduction with reference to the low water as well as the high?—The low-water surface is the same in both cases; there is no deduction; there was a certain amount of tidal contents above that low-water surface.

1658. Do you know, as a fact, that when it is high water at the bar, it is only just beginning to flow at Stella?—On an average, may I ask?

1659. Spring tides.—Average springs?

1660. Yes.—I cannot off-hand answer that. I may say No, as a fact, it is not.

1661. You have got a tidal section, I think, on your own plan to which you can refer, and you can give me a more exact answer to that question. When it is high water at the bar, you say it is not beginning exactly to flow at Stella; what is the condition of the tide at Stella?—I have not connected the tidal phenomena of the two sections of the river. (*The Witness referred to a section.*)

(*Chairman.*) We think that all this is very unimportant matter, and that you had better proceed to something more practical, and more distinctly bringing out the facts which you have to prove or disprove.

(*Mr. Brunel.*) This particular point——

(*Mr. Webster.*) You see, Sir, that this particular question is rather an impeachment of the truth of Mr. Rennie's survey.

(*Mr. Armstrong.*) No, it does not impeach anybody, it is an assumption about something as to which we do not know what the real fact is.

E. K. Calver, Esq., R.N.

27th January 1855.

(*Mr. Calver.*) I may remark that this has no connexion with the comparison with Mr. Rennie below Newcastle Bridge, to which part his calculations were confined; it is asking me something about Stella; it is a different question altogether.

1662. (*Mr. Seymour.*) Supposing Mr. Brooks is correct in stating that this error got into your calculation, would not the error become greater as the stations advanced up the river?—No; it would be greater as a difference of level, but not greater as to water contents. The level of the tide in the upper part of the river will be retarded, but it is in the smaller, and comparatively unimportant, part of the tidal receiver.

(*Chairman.*) We think you had better now proceed to the important point which you are to prove or disprove, which is whether the river has become better or worse.

(*Mr. Seymour.*) I may just ask you whether all the charges which you have made upon this class of accusation against Mr. Brooks do not rest upon a similar assumption as to the correctness of Mr. Rennie's report?

(*Chairman.*) That is an offensive question.

(*Mr. Webster.*) This gentleman is speaking to observations made five years ago, when he was called by the consent of all parties. Mr. Calver was the person selected by the Shields parties, by Captain Washington, and the Corporation, to make sections; he was therefore at that moment, and he is now, the admitted judge whom all parties consented to, and it is rather unfair to have him attacked in this manner.

(*Chairman.*) You had better not say anything more about it; regard the witness's feelings, and do not put any question to him in an offensive way, or calculated to produce a disagreeable result.

1663. (*Mr. Seymour.*) You gave evidence in 1850 upon the Tyne Navigation Bill; do you recollect stating the following as your opinion:—"If the low-water surface at Newcastle "was lowered to the low-water surface of Shields, my impression is that there would be a "fair equivalent in the extra current for the amount abstracted from its sides?"—I make that off-hand answer as a simple matter of opinion; I mention in my answer that it is a matter of easy calculation.

1664. When you say that it was an off-hand answer, do you wish to qualify the answer, or not? is it an answer which you would give to a similar question?—I mention that it is a matter of easy calculation.

1665. But do you consider that if the low-water surface at Newcastle was lowered to the low-water surface at Shields, it would be a fair equivalent in the extra current?—It might be, but still it must depend upon calculation.

1666. As a matter of principle, would not the same result follow from a reduction above bridge, assuming that opinion to be correct? If the low-water surface above bridge was lowered, would not that, as a matter of principle, produce the same effect?—If it was: it is the only way you can make a restitution for anything abstracted from the sides to lower the low-water sufrace and raise the high-water surface, and if you got the same quantity between those low and high water surfaces that you originally had at the sides, I should say that the condition of the river would be better.

1667. Would not that low-water come in every tide?—Yes; and another feature is, that it would be travelling over the main navigable track of the river.

1668. (*Mr. Armstrong.*) That would be an improvement?—That would be an improvement.

1669. (*Mr. Seymour.*) Is not the carrying out of that, which you say would be attended with such results, the object of Mr. Brooks' operations?—I believe it to be his intention.

1670. In point of fact, did you not upon that occasion state that there had been an impression made upon the low-water surface, "the impression that is made at present is "very trifling upon the low-water surface." Did you admit that an impression had been made upon the low-water surface at that time? I am referring to the same question in your evidence?—That is correct. I further explained it as too trifling for calculation.

1671. Can you inform us whether any impression has been made since, and, if so, to what amount?—I examined the river, as I stated yesterday, in June 1854. The reason of my being in the Tyne was to see, as nearly as I could within a few days, what were the main facts which had been developed since the survey of 1849. I at once entered upon a rapid examination of the principal part of the river. When I had finished that, so as to give a just view of the question, I immediately went to watch the tides, to see whether the high or low water surfaces had been affected by the operations since 1849. Before I attempted to make any tidal observations, I went out to Ryton, to the fresh water, to see whether there was any fresh in the river, because if there is any fresh, it disturbs the accuracy of any such observation. I found that a very heavy fresh had come down between the time of my starting from Newcastle and Ryton; therefore, I gave up the tidal observations, and did not attempt it.

1672. You say, with reference to the sailing channel, that you took the deepest water on your own sections, and found a mean loss of 8 inches in the deepest track of the river?—I did.

1673. Were not there more shoals and sharp points and holes in the time of Mr. Rennie, in 1813, than in 1849?—Distinctly, no.

1674. Does your survey show that there was a shoal opposite Bill Point?—No.

1675. That there was shoaler water?—I must clearly understand what the question is.

1676. I ask you, does your examination show that there was shoaler water opposite Bill Point?—I believe it was shoaler than in Mr. Rennie's time; but I admit it was a better navigation in 1849.

1677. Were there not deeper holes in Mr. Rennie's time, and I refer to Bill Point, and you say it was shoaler?—There was a deep portion of the channel below Bill Point which was shoaler at the time of my survey than in Mr. Rennie's time; but I do not call it a hole; it is a part of the main navigable track of the river.

1678. Have you ever called it a hole? I refer you now to page 535, question 18,197, upon the Tyne Navigation Bill Inquiry. "Are you aware that Bill Sand has gone "away from the reach above Bill Point?"—"Yes, it has." "Are you aware where "it has gone to?"—"It has gone mainly to a hole a little below it." "You stated "that the navigation there was materially improved in every respect?"—"The only dif- "ference I should like to have seen in producing the effect would have been to lift "that sand by dredges instead of letting it fill up a valuable part of the navigation."—It is probable I may have inadvertently called it a hole.

1679. You have spoken of the width of the sailing channel; can you tell me what the width of the channel is over the place where Hebburn Shoal formerly was, referring to your soundings?—Will you give me a depth, shall we say the four-feet channel.

1680. Yes, between the four-feet north and the four-feet south.—At low water there was a four-feet channel there of 185 feet wide; there was no four-feet channel at all in 1849.

1681. What do you find now?—A channel of four feet depth at low water now of 185 feet.

1682. What is the average depth across that place?—The shoalest water I suppose you mean?

1683. Yes, where the Hebburn Shoal was.—Hebburn Shoal has been deepened 1 foot 10, add that to 3 feet 4.

1684. Five feet two.—Yes; by the protrusion of those groins which I mentioned yesterday contracting the width of the river.

1685. Can you tell me what it was in Mr. Rennie's time?—I am speaking from memory, 3 feet.

1686. Can you say whether there was more than 15 feet at high water in Mr. Rennie's time? ——

(*Mr. Brunel, to Mr. Seymour.*) Have you any real soundings at this place, because the cross-examination might go on for a week. If this witness or you had just a chart of that place with the soundings on it one could see with a glance of the eye more than you would elicit in certainly a day's cross-examination.

1687. (*To the Witness.*) Have you such a thing?—I have not.

(*Mr. Webster.*) There will be Mr. Comrie's and Mr. Rennie's soundings.

(*Mr. Brunel.*) I refer to the present soundings.

(*Mr. Calver.*) I have a memorandum of it in pencil. Mr. Rennie's greatest high-water depth was 15 feet 10; take from that 12 feet 6, which was his lift of springs, and which I take to be unaltered, it is 3 feet 4.

(*Chairman.*) Do not you think, instead of going into these great minutiæ, if you could ask Mr. Calver general questions and obtain general answers on the subject as to the improvement or the deterioation, it would be better, since, as Mr. Brunel says, we may go on till the day after to-morrow inquiring about every different point, in which you may be sometimes right and sometimes wrong, and, most probably, both of you will be so; but it will end in nothing; we shall be as wise at the end of it as we were before? If you will be only so good as to take the river in sections, and examine the witness in gross, as to the improvement or deterioration of the river, you will get all that we want to know, or that it is useful for us to know.

(*Mr. Seymour.*) A good deal has been said as to Hebburn Shoal, Sir.

(*Mr. Calver.*) It was 15 feet below datum in Mr. Rennie's time.

(*Mr. Webster.*) There is no doubt about the improvement of Hebburn Shoal.

(*Mr Calver.*) It now admits vessels to Newcastle drawing 1 foot 10 more, as a fact.

1688. (*Mr. Seymour.*) Do you know where Walker Sands are?—I know where they were.

1689. (*Mr. Armstrong.*) By that answer do you mean that they are removed?—Yes.

1690. (*Mr. Seymour.*) Walker Sands, which existed and are shown upon the chart in Mr. Rennie's time, are now removed. I believe on Tuesday last you sailed over that portion of the channel where Walker Sands formerly were; did you or did you not?—They are removed, but of course it is only one part of the question. Walker Sands were at this point (*showing the same*) a large mass of sands. With the construction of that quay, this quay and the protrusion of these jetties (*showing the same*), the upper surface of that sand has been scoured away, and now where there was dry sand at low water there is no dry sand at low water.

1691. Will you point out where Wallsend Bight is?—Wallsend Bight, in Mr. Rennie's time, in the main navigable track of the river, would be in about this direction, going through these artificial works.

1692. In Mr. Rennie's time, without going into it too minutely, was not the course of the river there exceedingly narrow?—It was narrow, but not narrower than at present.

1693. Can you give the relative measurement; you see old Coxlodge?—It is a channel which cannot be exactly compared as a channel, because it is of a different character. In Mr. Rennie's time the channel was with shelving sides, a very different thing in the matter of navigation to where that channel is formed of artificial works and staiths.

E. K. Calver, Esq., R.N.

27th January 1855.

1694. Is the new channel opposite Coxlodge wider or not? I ask you whether the channel at Coxlodge is not wider than it was in Mr. Rennie's time?—The character of the channel is so altered, as I said before, that you cannot exactly compare the breadth; it may be a little wider.

1695. (*Mr. Armstrong.*) Do you think it is a little wider?—I think perhaps it is.

1696. (*Mr. Seymour.*) Has the channel been straightened or not?—Yes, the bight has been reduced; the channel, instead of going, as you observe, in the direction of my cane, went deep into this bight, and consequently is straightened.

1697. What is your opinion with reference to the relative merits of a straight or a curvilinear channel?—For what purpose?

1698. I want to know what your opinion is, which is the more effective for purposes of improving the navigable condition of the river?—The deepest water of the river would be more secured by a gently curved channel, than by a straight one—the deep core of the navigation.

1699. But I ask you, as a general principle with regard to the navigation of the river, whether the straightening of the river is not a more effective course in rendering the channel more navigable?—It renders the distance shorter, but there are other circumstances to be considered.

(*Chairman.*) Will you be kind enough to ask the witness about facts instead of opinions? You must recollect that Mr. Calver is not an engineer, and therefore these engineering questions will be more properly followed out by Mr. Brooks' examination.

(*Mr. Calver.*) I gave my evidence upon broad facts; I did not mean to enter into details.

1700. (*Mr. Seymour.*) Were you here during the evidence given by Mr. Straker?—A part of the time.

1701. (*Mr. Armstrong.*) You say the channel is straighter than in Mr. Rennie's time?—Practically, in 1849, the sailing channel was the same.

1702. (*Mr. Seymour.*) How is it now?—In 1854 I merely made a partial examination of the main estuary.

1703. (*Mr. Brunel.*) How was it?—Compared with 1849, it is greatly inferior.

1704. The whole of it?—The whole.

1705. (*Mr. Seymour.*) In what respect is it inferior?—It is inferior in its character as a navigation, as a whole.

1706. *Chairman.*) State how.—One shoal has been removed, Hebburn; but the channel, treated as a whole, is narrower. Jarrow Shoal still remains, and, compared with the exact condition in 1849, an additional shoal has been created.

1707. (*Mr. Seymour.*) Where has that additional shoal been created?—At this red spot.

1708. Will you refer to the chart of your recent soundings, and tell me what depth of water there is in the channel where Jarrow Shoal existed in 1849?—I have marked it; upon Jarrow Shoal, without respect to Jarrow Shoal being in the exact position of the river, there were 3 feet 9 in June 1854.

1709. Does this tracing show the plan, which you gave to Mr. Brooks, of your recent survey?—It does.

1710. What depth does it give over the place where Jarrow Shoal was in 1849?—3 feet 9.

1711. Looking to your own section, does not it show a depth of upwards of 5 feet where the 3 feet 9 inches is marked upon that plan?—No.

1712. Will you give me the figures?—They are all 3 feet 9, if you take it as a ridge across there.

(*Mr. Brunel.*) There is one of 3 feet 10.

(*Chairman.*) Now we understand the thing perfectly, that there is only a difference of 3 inches; that is, 3 feet 10, instead of 4 feet; can it be of the least importance?

1713. (*Mr. Seymour.*) Is there not a deeper track a little more to the north?—No.

1714. Just look to your chart?—I have already answered "No."

1715. However, is the 3 feet 9 that you speak of in the same place that the 4 feet is marked in Mr. Rennie's time?—No.

1716. You say, with respect to the sailing channel in 1813, that you found that a vessel drawing 4 feet water could proceed from Shields Narrows a distance of 28,000 feet without interruption?—I did.

1717. And that in 1849 the same vessel would be interrupted at the black spot marked Jarrow Slake?—She would.

1718. Would not such a vessel in 1813 have had to pass Howdon Shoal?—She would.

1719. Where is Howdon Shoal?—(*The Witness pointed out the same.*) It is where it is marked, 4 feet.

1720. That shoal is close, you say, to Jarrow Shoal; just show me Jarrow Shoal.—(*The Witness pointed out the same.*)

1721. Can you tell me the range of tide from low water at each end of Jarrow Quay?—13 feet 9 the lower end, 13 feet 6 the upper end, was the range in 1849.

1722. What is the range now?—I have already answered that I have not taken that.

1723. Looking to the chart on the wall, what depth of water have you described? you have put it there 3 feet 9, I think?—Yes.

1724. You have spoken of a new shoal; did you endeavour to find that shoal when you went down on Tuesday last?—I gave evidence about that yesterday; that Mr. Brooks commenced sounding at a particular part of the river, and afterwards the soundings were

continued by my request; during the taking of these soundings, the same feature was crossed which I term the New Shoal.

1725. What was the lowest depth you found in taking those soundings? was it about 6 feet 9?—There is a question between 6 feet 3 and 6 feet 9.

1726. About that; was it upwards of 6 feet?—6 feet 9 at that time of tide.

1727. Did you examine the tidal gauge immediately opposite?—I saw that there were 3 feet 4 at that gauge, without knowing what the value of the gauge was as to level.

1728. By adding 11 feet 9 to 6 feet 9, in order to find the depth at high water at a datum tide, would not that give 18 feet 6 as the condition at that time? Taking it at 3 feet 3 on the gauge for my calculations (you say 3 feet 4), assuming that it is a datum gauge, that it is 3 feet 3 above zero, would you not have to add 11 feet 9 to 6 feet 9, to find the depth at high water?—No.

1729. (*Mr. Armstrong.*) Tell us what you would make it, according to your calculation?—It is a matter of figures, and I cannot immediately refer.

1730. (*Mr. Seymour.*) Do you not give 18 feet 6 or 18 feet 5 upon that calculation?——

(*Mr. Webster.*) That assumes that there is 15 feet rise of tide there, which I believe is not the case.

1731. (*Mr. Armstrong.*) The only question of difficulty in the calculation, as I understand the witness, is, that he does not know what trust he can give to that gauge?—Quite so.

1732. Assume the gauge to be correct, and then give the answer?—It is 11 feet 9 to 6 feet 3, or 6 feet 9, as it happens to be; that is 18 feet.

1733. Assuming it to be 6 feet 4, it is 18 feet, but assuming it to be 6 feet 9, it is 18 feet 6?—Yes; assuming that gauge to be correct.

1734. (*Mr. Seymour.*) Can you tell the rise of tide?—In 1849 I have mentioned it was 13 feet 6.

1735. Take 13 feet 6 from 18 feet, what will that leave at low water?—4 feet 6.

1736. Does not that prove that there is no 4-feet obstruction to be found there?—I have made no survey in January 1855.

1737. If that be so, can there be a 4-feet obstruction there?——

1738. (*Mr. Armstrong.*) These surveys were made in June last, I understand?—Yes.

1739. (*Mr. Seymour.*) My question was with reference to the trial on Tuesday last. You stated that you found a 6 feet 3 depth on that day. I then asked you upon that calculation, and, I believe, I have got your answer?—Assuming that gauge to be correct, there would be 4 feet 6, but there are two things in that examination which I should not be content with. I should go deliberately and examine the shoal and see that my gauge was correct.

1740. You have spoken of the increase of the number of acres of shoals in 1849, as compared with 1813; will you tell me how many acres of shoals, dry at low water, you found between the river lines from the west end of Saint Anthony's Reach to the lowest works made by Mr. Brooks in Jarrow Bight?—I have not made any examination of dry shoals; my examination was simply confined to the navigable condition of the channel, not with any particular reference to any dry sands.

1741. You said yesterday that you had not prepared the tracings so as to give the low-water area in its present state to enable us to form an opinion upon it in 1849 and 1854?—I have made no examination of nice quantities between my examination of June last and my survey of 1849.

1742. Can you say whether the low-water area has increased, or not, looking to your soundings of 1854? I will give you a place if you like; take the soundings from the west end of Hebburn Quay to the east end of Jarrow Quay, which I believe are the whole of your soundings?—Yes.

1743. In your opinion, taking those soundings, has the low-water area at the present day increased or not?—The low-water area from the upper part of Hebburn Quay to the lower part of Jarrow Quay is the principal part, and that has decreased 40 feet in breadth. I should say, simply as a matter of opinion, that the whole area was less at the present time than in 1849.

1744. I have asked you with reference to your soundings, do not your soundings show between these limits a generally deeper channel?—I should say, deeper, taking the average but 40 feet narrower; one must be taken with the other.

1745. I believe you expressed an opinion in 1849, that the maximum depth had then been attained in the Tyne?—Really after five years I cannot exactly remember; anything special and important I shall be very happy to answer.

1746. I call your attention to a book which you have published, on the Conservation and Improvement of Tidal Rivers, page 52.—That is merely a matter of experience, but no critical examination.

1747. I ask you, whether in 1853 you were not of opinion that from the circumstances of the case with reference to the Tyne, referring to the deepening of the channel, nothing more could be done? Have you not expressed the opinion that the river could not be any deeper?—I was treating the whole subject; but there are so many things to take into consideration.

(*Chairman.*) I think you had better allow us to draw our own conclusions from that sort of thing, instead of questioning upon it.

1748. (*Mr. Seymour.*) I think you referred yesterday to a survey by Mr. Comrie, made in

E. K. Calver, Esq., R.N.

27th January 1855.

1854; are you aware that the late Mr. Comrie made a survey in last September?—I have not been on the Tyne since June.

1749. Have you seen a survey of Mr. Comrie's made at that time?—I have not.

1750. Have you compared the state of Shields Harbour in 1849 with its condition at present?—I have distinctly stated that my examination in 1854 was confined between Hay Hill Point and Hebburn Quay.

1751. (*Mr. Armstrong.*) In 1849 you made an entire survey?—A perfect survey.

1752. (*Mr. Seymour.*) I will take you to the bar. Did you not in 1849 give evidence to the effect that the sectional area at the bar, measured between similar points, or between the 3 feet contour lines, had diminished one quarter, in consequence of the abstraction of the tidal water from the ancient bed of the river, in consequence of the works of the former Conservators?—I mentioned the fact of the reduction in evidence yesterday.

1753. Have you mentioned that fact on previous occasions? did you mention it in 1850, for instance?—Possibly, if you refer me to it.

1754. Is it not a fact, which you have pressed strongly upon the Admiralty, the reduction of this quarter part in the sectional capacity of the bar?—Inasmuch as the bar is one of the most important subjects connected with this river, I have mentioned it amongst other subjects for comparison.

1755. What do you mean by sectional capacity, when you use the expression as applied to the bar?—The length upon the ridge of the bar multiplied by the depth.

1756. Then you mean the sectional capacity for the discharge of water at the bar?—I am not aware that, as a matter of comparison, I have said anything about discharge. I have measured the navigable channel over the bar.

1757. I observe you used the expression yesterday "the sailing channel over the bar," when you spoke of this quarter diminution. On previous occasions you have spoken of the sectional capacity of the bar?—The sectional capacity of the sailing channel over the bar has been the subject of my comparison.

1758. On each occasion you referred to the sailing channel?—On each occasion of comparison.

1759. Has your attention been called to the book to which I have already referred you, to observations of Mr. Brooks, in reply to a similar charge made by you previous to the year 1852?—I have read the book,

1760. I will just call your attention to the following passage: "I shall now close my "remarks on this division of his letter, by stating very plainly, that Mr. Calver has greatly "misrepresented the sectional area of the discharge of the water of the Tyne, as it appears "upon his own recent survey. I state that he has not given you the breadth between two "similar points, as he tells you he has done"——

1761. (*Mr. Armstrong.*) Was it between the same points that you made your comparison?—It was between similar points. I can describe the course. The bar shifts in character, and I must assume something on either side to measure the sectional capacity; but I have assumed exactly the same system of determining the sectional capacity of the same channel over the bar at the two times of comparison.

1762. (*Mr. Seymour.*) In 1849, as the width of the bar, did you take the shortest distance you could find between the three feet contour lines on the Herd and Spar Hawk sand-banks?—The length of the district of comparison in 1849 was 1,250 feet, roughly.

1763. If you multiply that by 6 feet, that would give a sectional area of 7,550 feet, within that breadth at low water?—Yes; I have given it in evidence.

1764. Did you take into your calculation the discharge which takes place between the Spar Hawk and the shore? did you take in, or did you exclude, from your calculation the section between the Spar Hawk and the shore?—The section between the Spar Hawk and the shore had nothing to do with the bar. I was merely comparing the navigable track over the bar.

1765. You did not make the calculation?—Certainly not the discharge; it is not the place where I should make the measurement at all.

1766. Can you say, looking to your survey, what the depth was in 1849 between the Spar Hawk and the shore?—There was a channel of from 4 to 5 feet between the Spar Hawk and the shore, but not connected with the navigable track over the bar. There was a little channel between the Spar Hawk and the shore in 1849 of from 4 to 5 feet.

1767. What is the length of the section from the 3 feet contour line to the shore? is it or is it not 750 feet?—It is 800 feet.

(*Chairman.*) We think that all this is much better proved by somebody else than by Mr. Calver. Mr. Calver has already given opinions upon the subject which you cannot expect him to withdraw from or to give up.

(*Mr. Seymour.*) Then, Sir, I will not press that inquiry further.

1768. (*Mr. Webster.*) Upon this last point the information which you gave to the Royal Commissioners, and on which you expressed an opinion in 1849, was as to what you called the capacity of the navigable channel at the bar?—The navigable channel at the bar.

1769. But besides that, there was another outlet through which water would escape or go in?—There was.

1770. But not suitable for navigation?—No.

E. K. Calver, Esq., R.N.

27th January 1855.

1771. At that time or at any other time did you attempt to give a calculation of the section at the bar for the purpose of discharge simply?—I have never made a calculation of the sort.

1772. If you were treating it as a question of discharge simply, would the proper place to make the calculation be at the Narrows or the narrowest section in the river?—At the Narrows, because it is subject to only one disturbing force, which is the current, whereas the bar is subject to two, the wave and the current.

1773. As regards what I will call your bar of 1854 and your bar of 1849, was there any or what difference in them?—The bar of 1849 was 6 feet 8 at low water, 21 feet 8 at high water; the bar of 1854 was 6 feet 8 at low water, or 21 feet 8 at high, exactly the same at the two periods.

1774. And what was it as regards breadth?—The general breadth the same.

1775. Are you aware of any exact calculations having been made as to the amount of fresh water coming from the up country?—I am not aware.

1776. I believe it is very insignificant as compared with the quantity of sea water?—Generally, in a quiet state of the river.

(*Mr. Webster.*) There is a paragraph, Sir, on that point in Captain Washington's Report, to which I did not call your attention, page 12.

1777. (*To the Witness.*) With reference to the question of tidal receptacle, assuming that the high-water surface were raised, and the low-water surface depressed, is it the difference between those two that gives you the tidal volume each tide?—The tidal quantity.

1778. Is that quite independent of the depth at particular points of the channel?—It is a distinct question altogether.

1779. Are you aware that Mr. Brooks has expressed himself that the most important series of observations or sections were longitudinal sections, and not transverse ones?—I am not aware of it.

1780. But in your opinion are transverse sections equally important with longitudinal sections?—There is no other comparison of any general value.

1781. At all events, in your opinion, are transverse sections of equal importance with reference to this question as longitudinal sections?—Of far more importance, because in a transverse section you get the contents of the tidal receiver.

1782. When you were employed in 1849, in the observation which you then made, and of which you have now given the result, were not you employed by the consent of the Shields party, the Newcastle party, and the Admiralty, to measure particular sections which they pointed out?—At the beginning of the season, as I stated, but my elaborate survey was by order of the Admiralty, for their own information.

1783. And, as regards this question of the tidal receptacle which you have spoken to, are the results which you have given derived from the summation of the sectional areas at the two periods upon the sections which you have taken?—They are.

1784. Is your result of what I will call the per-centage of loss independent of the absolute quantities?—It holds good, independent of the quantities, certainly.

1785. Does the per-centage which you have given of absolute loss hold good independent of the absolute quantities?—Most distinctly.

1786. (*Captain Fitzroy.*) With reference to the last question, whether the change in the per-centage of water admitted is a guide to the improvement or deterioration of the river, is not that liable to be affected by the shape of the river between the places of the sections, as well as by the shoals that may have altered their position from time to time in these same spaces? The per-centage may appear to be very accurate, according to the various sections used, but if much change has taken place between the positions of those sections, it may, in reality, give a very fallacious result?—No, because the subject of comparison, the tidal water, is above the region of the shoals altogether; it is only affected really by works at the side.

1787. All the shoals in the river are not entirely below low-water mark, are they?—Not all.

1788. Those shoals are liable to vary very much between low-water mark and their highest point?—They are.

1789. Referring to the acreage of shoals, must not the horizontal limits of those shoals be very much a matter of opinion, from what point you are to begin to measure upon the chart, in estimating the horizontal area of any particular shoal?—It is not exactly horizontal, because the low-water surface of the river is an incline, and I have a certain gauge there which tells me where I am to commence the comparison, and I determine from the bottom of that gauge.

1790. In point of fact, do not you reduce your area of shoals to a horizontal level? you take the measurements upon the paper from the one edge to the other, and you calculate the space between those bounding lines; the acreage is a horizontal measurement; in fact, you make no allowance for incline in the calculation?—Not upon the plan.

1791. Then is it not a matter depending very much upon the surveyor's personal opinion, as to where a certain shoal begins and ends?—No; it is a matter of actual observation.

1792. At what time of tide does he measure the exact limit of that shoal? at an ordinary tide, or an extraordinary spring tide?—The only shoals which I have measured were when the water was exactly at Mr. Rennie's low-water datum; when the water was at Mr. Rennie's low-water datum, all the shoals which were then dry at low water I have taken the area of at the two periods, having already stated that the low-water surface has

E. K. Calver, Esq., R.N.

27th January 1855.

not been affected, nor the high-water. The high-water is still a dead level, and there is still the same difference of level between Newcastle and Shields.

1793. Upon what grounds can we rest with reference to Mr. Rennie's datum level? was that datum level the level of an ordinary spring tide, taking an average throughout the year, or was it at low-water spring tide at the equinoxes? have you any foundation for the choice of one or the other?—As a matter of memory, his low-water gauging was the low-water incline of a certain tide. I am not immediately certain of it. I know the high-water was.

1794. As that is a point upon which the correctness of the whole survey, and all the soundings must depend, all having to be referred eventually to one datum level, it becomes a point of the utmost importance to ascertain whether the line to which they all refer is the line of an ordinary low-water spring tide; that is to say, an average spring tide taken throughout the year, or whether it is the low-water spring tide of extraordinary tides, such as those which take place at the equinoxes, or near the equinoxes?—The whole comparison, I may state, was referred to the 15 feet datum line in all cases. Having found that Mr. Rennie's low water surface was unaffected, I, of course, took the same rise at that part to reduce it down to low-water.

1795. That is not an answer to my question; my question is, what authority have we for Mr. Rennie's datum level?—The tide observed on the 31st of May, though not an average spring tide, as it rose 14 feet 11 inches, is that which was taken as a datum for all the soundings marked on the plan. That tide of the 31st of May is that marked on the south-west corner of the Low Lighthouse at Shields; every measurement in the river, whether of shoals, channels, tidal contents, or any thing, was referred by me at the two periods of comparison to this datum level throughout the river—an absolute level.

1796. Then that tide was one taken arbitrarily—it was not an average?—It was not an average; he mentions it particularly in his survey, that he was forced, in order to save time, to assume a certain level, because he could not, perhaps, take an average till the summer was over.

1797. I ask the question particularly, because much pains was taken some 20 years ago in ascertaining a datum level line for the Thames; and it appears, as far as I can ascertain it, that no such particular precautions were taken in the Tyne in Mr. Rennie's day; it is not likely, perhaps, that they were?—No; the level which he established here had reference simply to the Tyne itself, and not any levels on either side of it. It was judicious to leave on record a certain datum to which future examinations of the river might be referred as an absolute line.

1798. In ordinary conversation about the rise of tide, if one set of observations are referred to Mr. Rennie's arbitrary datum level, and another to the actual lowest tide at extraordinary springs, or to the actual lowest tide taken throughout the year, or to a regular average, there must be considerable confusion; persons refer their measurements to three different standards—one set to the extraordinary spring tide; another to the ordinary tides upon an average throughout the year; and the third to Mr. Rennie's arbitrary datum level. Is it not so?—Not in this comparison which I have given.

1799. But in general discussions about the Tyne we are all liable to some confusion, in consequence of various persons starting from those three different points?—Everything which I offer, with respect to the Tyne, has distinct reference to this 15 feet, whether in 1813, 1849, or at the present time.

1800. Speaking of the general question, there is that degree of uncertainty thrown over the assertions of various parties, on account of their measuring from three different points?—Possibly.

1801. It is difficult to ascertain, without going to the root of the matter, what in each case is meant, because they measure from different starting points?—Quite so. I believe I did not state it in my evidence yesterday; but I find that when the tide rises to the 14 feet 11 inches at Shields, it rises exactly to the same level, 14 feet 11 inches, or 15 feet at Newcastle.

1802. At a subsequent period?—Of course, at a subsequent period of the tide; it is an hour and three minutes afterwards.

1803. (*Chairman.*) It rises to the same height exactly?—Yes, as it was in 1813.

1804. (*Captain Fitzroy.*) The fact being, that the case of the Tyne is similar to that of the Mersey, and totally different from that of the Severn?—An entirely different case.

1805. The water in the Tyne, rising from time to time at successive intervals up to a certain uniform level line, and no higher; the tide in the Mersey rising similarly; and in the Severn, being impelled by a tidal impulse rather than by the filling up of the receiver, it is there swelled to a very much greater height than the horizontal level; it rises there to some 20 or 30 feet above the mean tide level?—It does. I may mention, as an interesting fact, that all the rivers upon this coast—the Tyne, the Wear, and the Tees—rise to a dead level; the Severn is an entirely different case.

1806. Referring to the capacity, recurring to the comparison of the body of water between the high and low water levels, although there may be a difference in the quantity of water between the high and low water levels in the present day, as compared with Mr. Rennie's day; admitting that to be the case, supposing the total difference to be considerable, might not the river nevertheless have been very much improved for navigable purposes, if the space between the low-water level and the bottom of the river had been considerably deepened?—It depends upon the character of the bed below that level, indicated by these diagrams.

1807. I only ask whether, if the section below low-water level had been increased throughout the extent of the river, so that ships of a greater draught of water could navigate the whole length of the channel, that river for purposes of navigation would not have been improved?—Though it may be larger, it is not implied that it is superior as a navigation; as to simple depth, certainly.

1808. The object being to make the river as efficient as possible for navigable purposes, an increase of depth, provided it has sufficient width for ships to pass up and down, must be an improvement?—If it is in connexion with a strict preservation of the quantity, because they are two questions entirely.

1809. Will you be kind enough to answer the one question, whether the river being wide enough to admit of ships passing up and down, an increase of depth simply will not be an advantage?—An advantage to any vessel passing from Shields to Newcastle.

1810. With reference to the drainage of the country, of which the Tyne is the great drain, have you seen Mr. Taylor's work on the subject?—I have. I read it at the time it came out.

1811. And also the evidence which has been quoted before previous Committees, of the amount of drainage, as far as it has been hitherto estimated, of the area of the district of country through which the Tyne flows?—I have.

1812. You are aware that in Mr. Taylor's work the calculatiou has been gone into rather elaborately?—It has.

1813. Just now, in answer to a question as to the discharge of water, I understood you to say that no estimate had been made of the amount of fresh water discharged by the Tyne?—The question which I had to answer to was the discharge of tidal and fresh water at the Tyne bar, not the simple land discharge at the fresh-water river, but the whole discharge of the Tyne, salt and fresh, at the bar.

1814. If the bar were deepened, and the flow of water facilitated each way near the mouth of the harbour, would not the ingress of the salt water, and the outfall of the fresh water cause an improvement in the navigation of the upper part of the river? would it not be advantageous for the stream of the river, that the mouth should be widened as well as deepened?—Certainly, at the Narrows especially.

1815. Can you tell us a reason why no efforts have been made during the last 40 years to improve either the bar or the mouth of the river? are you aware of any reason?—I am not, but I might state, as a matter of opinion, that if they had attempted to improve the Narrows in the present state of the river, they would have failed, because it is due to certain causes which we cannot do away with, and if you attempt to attack the effect, it is lost labour. I refer to the Narrows themselves; I may go on to explain that when the piers which are intended to be erected at the mouth of the Tyne are formed, the Narrows themselves will be improved by that very operation.

1816. That is a question of the future; there may be differences of opinion upon that, but referring only to the past, there certainly must be some well-known reason, though I am utterly ignorant of it, why no effort has yet been made to improve either the bar or the mouth of the harbour?—I know of none, except perhaps the impracticability of it.

1817. While the bar will only admit ships of a certain draught of water, most of which can go up to Newcastle, may there be any indifference as to deepening it very much more, so as to admit ships of a great draught of water to Shields only? Would the increase of deep ships at Shields tend immediately to the advantage of Shields?—From lying there, certainly.

1818. Ships of a much greater draught of water than now go up to Newcastle, after having discharged part of their cargo at Shields, benefit both Shields and Newcastle, do they not?—As a matter of commerce, I should think so.

1819. But if larger class of ships were admitted, by deepcning the bar and widening the mouth of the harbour, ships for which there is water enough in Shields Harbour, and for which abundance of water might be made in docks near Shields Harbour; would not such a measure tend directly to the advantage of Shields, and not directly to the advantage of Newcastle?—As a commercial transaction, having got to Shields, it is very much superior having them at Shields than at Newcastle.

1820. Very deep ships can only go into Shields Harbour at present?—That is the only port at present. North and South Shields is the deep portion of the Tyne at the present moment.

1821. Ships of a moderate draught can go up to Newcastle?—They can.

1822. With all due respect to the engineers, I have also great respect for the opinions of practical men of my own profession (if I may say so without presumption) who have been dealing with water and the effects of water upon banks and so on the greater part of their life. I am very anxious to ascertain your own opinion about the effects of the half-tide walls eventually, whether you consider them as permanently good works or as half measures, that will only act for a time? I state it as my deliberate opinion that if half-tide walls had been formed from the first in the River Tyne, the remainder of the basin between the half-tide walls and the shore would have been maintained as a part of the tidal basin nearly in perpetuity with a little careful conservation.

1823. Then what is to become of the silt, and the ballast, and the washing down from the land, and the falling in of materials, and so on, which at presents tends to fill up the space behind those half-tide walls? how will that gradual silting up, which everybody acknowledges to take place now, be avoided?—The coarse portions are kept in the mid-river, the finer portions go into the quiescent parts of the current; but allowing for a

E. K. Calver, Esq., R.N.

27th January 1855.

deposit on an incline, such as we are supposing in rivers of that sort, the wave in high winds and the agitation produced by steam paddles, as a matter of opinion, would be sufficient to deal with it.

1824. That is after the banks behind those half-tide walls have grown up to the level of the half tide?—Quite so.

1825. But an amount of cubical capacity will have been displaced from the flow of the tidal water by the scour behind those half-tide walls before that takes place?—But the very fact of the establishment of these half-tide walls, still retaining a heavy amount of tidal scour within them, would remove, as a matter of opinion, the banks, and generally improve the navigation between them, so as to give you an equal amount of tidal water; it would scour off the surface sands between the tidal walls, and one should be put against the other, being both in the tidal region.

1826. Suppose that the material out of the channel there went behind these walls?—It would do so for a certain time, till it had filled up to the top of the half-tide wall; after that it is my opinion that it would remain permanent between the wall and the shore. I found that upon my experience of the Tyne and other rivers. This great Jarrow Slake in an interval of 36 years had not altered at all in height of surface, neither by my examination nor Mr. Rendel's.

1827. But by carrying a half-tide wall along the edge of Jarrow Slake now, you would immediately cause Jarrow Slake to rise up; it would grow from year to year by the deposit of silt and ballast upon it?—The general level of Jarrow Slake being about half-tide or near the top of this wall, as a matter of silting upon Jarrow Slake, I do not think it would have any effect.

1828. The placing of a half-tide wall along Jarrow Slake would prevent the wash of the water over the Slake which now prevents it from growing up. The wind and the water now clean as it were the top of Jarrow Slake, but if you bound Jarrow Slake by a wall carried along its edge, you prevent the water and the wind together from carrying off those particles which now are washed off every tide. Therefore it appears that the effect of a half-tide wall would be to produce the growth of land immediately behind that wall, and if you take other opinion upon the subject, it has been over and over again asserted that the object of these very walls in many places has been to make land. I would ask whether, looking at the length and bulk of these walls, however advised by engineers their effect has not been to displace a very large quantity of tidal water up to the present time?—Yes.

1829. The bulk of all these works, taken together, has displaced a great amount of water?—Up to 1849 it displaced what I gave in evidence, and, in addition to that, an extra quantity. The 34 acres of solid land which I mentioned yesterday have displaced a very great quantity of tidal water, as a simple fact.

1830. After the water has risen above the level of those walls, does it not spread from one side to the other, lose, to a certain extent, its velocity, and deposit its silt behind those walls in the same manner, but not to so great a degree, as it happens when there are no walls at all?—No; because at every short distance this is bounded by certain quays, called transverse groins. It is made still water, and the deposition is very quick, and, in course of time, the deposition, from having these still places to go into, becomes dry land, which is not the case I am assuming, namely, that the half-tide walls are carried out properly, and that the whole of the dry alveus of the river between that and the original shore is kept entirely unaffected by staiths and such things in a river like this.

1831. But if you carry a half-tide wall from one end to the other of a shoal, and cut off that shoal from communication with the current of the river, it must make very little difference whether there are groins or no groins behind that wall, because the half-tide wall itself will form a pen or weir. It will be a boundary to that shoal, within which deposit will take place as fast as possible?—To the height of the wall it would rapidly fill up.

1832. Then the result of the wall seems to be a general rising of the bank of the river?—A triangular space between the shore, the top of the wall, and the bottom of the wall; but after it has arrived at that point, simply as a matter of opinion, it will remain permanent, from the causes which I have already mentioned.

1833. The water, after rising up to that height, will spread, lose a certain amount of its velocity, whether ebbing or flowing, and, in consequence, drop the silt in these banks, and tend to make land?—In a quiet day it would; but again, that light deposition mentioned would be removed by these two causes: the ripple of the wave generated in such a long reach as that, and the constant moving of the paddles of these numerous steamers.

1834. You have witnessed, I dare say, very heavy freshes in this river?—I have.

1835. In the strongest freshes, at about what rate does the water run through Shields Harbour, between the two Shields, just inside the Narrows?—I have, fortunately, an observation which I made in June last.

1836. Fresh and salt water going together?—This is not in a fresh, it is in a common state of the river.

1837. I refer to a heavy fresh?—I have a distinct observation of a very heavy fresh at Newcastle, but I have, unfortunately, not the same at Shields, to join the two. The maximum was 25,200 feet per hour; that is 5 statute miles.

1838. Speaking as a seaman, at how many knots does the water run, with a heavy fresh at the lower part of the river?—I should not like to give an opinion off-hand.

1839. As a seaman, and from your knowledge of the river as a surveyor, you must have

formed an opinion upon that subject?—I am not aware that I have observed a fresh and the tidal water together.

1840. It is a matter upon which I feel it a point of honour, as a surveyor myself, to be able to give an opinion in so important a question. What is your opinion of the power or velocity of the river Tyne when a heavy fresh combines with an ebb tide running through Shields Harbour?—The rate would be greatly increased over the common circumstances of the tide.

1841. I ask you for a definite opinion in knots. At how many knots do you think the water runs through Shields Harbour when a heavy fresh combines with an ebb tide?—Simply, as a matter of opinion, about four nautical miles, I should think; four knots.

1842. Have you ever heard it stated that it runs 6 knots and upwards?—I have heard it stated.

1843. Do you believe it?—No. I imagine that is one of the subjects on which the greatest mistakes are made, about rate of tide.

1844. Have you ever been in the Tyne when quantities of ice were brought down?—Not to my knowledge.

1845. Do you think that the removal of the old bridge, and the building of a bridge with an arch of very wide span, would improve the navigation of the Tyne, or injure it?—I believe it would improve the whole navigation of the Tyne. It would have a particular effect upon the tidal propagation; and, to show the reason of that opinion, I may mention that the state of any river, respecting its power of transmitting tidal water up it, is generally estimated by the time occupied by the crest of the wave in arriving at successive portions of the river. The result of my mean observations respecting tidal springs is, that at high water, the crest of the wave travels from Shields to Bill Point at the rate of thirteen miles per hour; from that to Newcastle Bridge, only eight miles per hour; after passing Newcastle Bridge, from that to a place called Leamington, speaking from memory, the rate is twenty-two miles per hour, showing the effect of a great reduction of the section by the old Newcastle Bridge.

1846. I think you stated that, in your opinion, a curved river line was better than a straight one?—Yes.

1847. Supposing that the passage of water completely filled the channel, so as not to admit of eddies or delays in any part, would it or would it not be better, in your opinion, that a river should be as straight as possible, as much like a pipe as possible, for carrying the greatest quantity of water from the country to the sea, and for admitting the greatest quantity of water from the sea easily up the river?—Simply as a matter of transmission, I believe that a straight channel would be better, because a straight channel implies a decreased distance; but a straight channel, I may, say on the other hand, would be inferior for navigable purposes.

1848. The reason of that inferiority being, that water always has a tendency, upon meeting the least impediment, to try to avoid it; and therefore, in channels where the bottom is of an unequal character, it shoots from one side to the other to get on as fast as it can?—Yes.

1849. That is the present effect; but the object being to get as deep water and as uniform a depth and as straight a line as possible, would not the most perfect channel be as near the shape of a pipe as possible, that is, straight and of uniform size?—No, for this reason: if your straight river was of any breadth, you would have no security for the maintenance of the deep-water channel of that river in any one position; but if you give a slight bight, if I may so call it, you then retain for ever your channel for the navigation of the river exactly in the same spot.

1850. I am aware that that is the case at present, because most rivers are wider than is necessary for conveying the quantity of water which passes; therefore the water is at liberty to take its easiest course to and fro, from one side to the other; but if you contract the channel of the river, so as to ensure the whole body of water ebbing and flowing in the same channel, will there be any superiority, under such circumstances, in a curved channel over a straight one?—Let the quantity of water passing in the channel be large or small, a curved channel in every case, as far as navigation is concerned, is superior to a straight one; but considered simply as a conductor for the transmission of water from one part to the other, a straight channel is superior, because there is less friction.

1851. Supposing that the conducting of that water causes a greater scooping, and a greater cleanness of channel throughout, will not that channel be better for steam navigation than any other?—No; because steam navigation gets the advantage of the deep channel the same as any other.

1852. Your object at present, particularly in this river, is to get a channel through which ships can go up and down in the shortest possible time, and with the greatest draught of water?—That is an inferior object in the Tyne; there are other objects.

1853. What are the others?—The great object, if I may so call it, is to maintain the port and the bar; and, as a matter of experience, I say to do that you must retain the tidal contents; that is the first thing for a judicious conservator, in an important river like this, to take notice of. Then the second one is the transmission of vessels from Shields, the port (which is eminently valuable to the public), to the higher part of the river, to the parties who wish to receive the vessels; they are two independent questions altogether.

1854. My question referred simply to the Tyne as a navigable river. If the Tyne

E. K. Calver, Esq., R.N.

27th January 1855.

depended upon tidal water only for its depth, if there were no land floods, if there was no great drainage of country carried out to sea through the Tyne, the value of the tidal water would of course be inestimable?—Quite so.

1855. But looking at it as it is at present, it being a mixed question of the combination of tidal water with fresh water, the principle of straightening or curving the course of the river, while producing certain levels, and making certain alterations, becomes a very material one; and as it is one upon which the first engineers have certain opinions, and practical men have also strong opinions, I am anxious to take this opportunity of asking your opinion, as one of the most experienced persons upon such subjects, with regard to the principle?—In the case of the Tyne, those two branches of the subject are very distinct, indeed. The great question which must always be kept in view, for the benefit of the locality and the public, in the Tyne, is the public port and the bar; then in order the interior navigation of the river.

1856. (*Mr. Brunel.*) Have you taken any other soundings which would show a change in the bed of the river, except those relating to Jarrow shoals?—I took no soundings in the Tyne except those of 1849 and 1854.

1857. Have you taken sufficient, however, to enable you to show by soundings what change has taken place at any part of the river except that which we see on the wall at Jarrow Shoal?—Yes, there is one at which I happened to experience the same thing. Subsequently to the Admiralty survey, in fact, on the 29th of May last, I came over here and hired a steamer to enable me to put in the lands formed in the tidal basin since 1849, running rapidly over the river. To do that I got a vessel of light draught at Shields, I think 3 feet 6. When I got up opposite the place called Wincombe Lee Powder House, which is just below Bill Point, in that part this steamer of light draught, drawing as a matter of memory 3 feet 6, stuck, not in the middle of the river, but a little on one side of the middle. I took soundings where she was and compared with the depth, and found there was a distinct difference from the Admiralty survey of 1849.

1858. At that place did you take distinct soundings at certain points, so as to compare the bed of the river with other periods?—No, I merely mention the fact.

1859. Have you any means of making any other comparative charts of parts of the river, showing the changes that would appear to have taken place between 1813, 1849, and the present time, except at Jarrow?—No. This being rather an important part of it, I just prepared these diagrams to show you.

1860. With respect to the comparison, are all those soundings from Mr. Rennie, taken from the original survey of Mr. Rennie, which we have before us?—They are taken from Mr. Rennie's plan.

(*Mr. Brooks.*) This is one of the original plans of Mr. Rennie (*producing the same*).

(*Mr. Brunel.*) Is the original of that survey to be found?

(*Mr. Brooks.*) Yes, it is very large. I can bring it. This is precisely the same.

(*Mr. Calver.*) When the original is produced, I shall be glad to point out all these features.

1861. (*Mr. Brunel.*) With what degree of accuracy may the four feet be assumed to be? is it something between 4 feet 6 and 5 feet 6, or may it be 3 feet 6, or what?—Mr. Rennie's soundings are taken to inches; it is a most beautiful survey.

1862. Is it 4 feet more or less, or what?—Exactly 4 feet; if it had been more than 4 feet, I should have added the inches; they are given to inches in beautiful detail.

1863. Then the difference there, is between 4 feet and 3 feet 9, from 1813?—The difference between that and the later period, it is the difference between 4 feet and 3 feet 9, in the one case, and 3 feet 10 in the other, at that part of the examination.

1864. Have you any cross sections or accurate measurements which would enable you to supply us with the sectional area at the narrowest part of the Narrows now as compared with what it was in Mr. Rennie's time?—In 1849?

1865. Have you about corresponding sections with Mr. Rennie's?—Yes, in every case.

1266. Will you let them be entered upon the evidence?—I can give you high and low water; I can divide them into sections of 6. The first 6 sections are opposite to the Herd Beacon, agreeing with No. 1 marked on the lithographed Admiralty Survey. Mr. Rennie's high-water section No. 1, is 16,253; in 1849 the same high-water section is 15,935. No. 2, proceeding upwards, Mr. Rennie's, 15,253; 1849, 16,625. No. 3, Mr. Rennie's, 18,161; 1849, 18,700. No. 4, Mr. Rennie's, 27,170; 1849, 24,483. No. 5, Mr. Rennie's, 25,160; 1849, 19,800. No. 6, Mr. Rennie's, 24,310; 1849, 21,164.

1867. They correspond with Mr. Rennie's, assuming the same high-water mark?—Yes.

1868. What was the velocity which you mentioned with respect to the tidal wave up to Bill Point?—13 miles per hour.

1869. That diminished to 8, immediately up to Newcastle Bridge?—Yes.

1870. And it then increased immediately beyond to 22?—22½ to Leamington, 4½ miles in 12 minutes.

1871. Do you draw the conclusion, from that rapid increase of the tidal wave as between Newcastle Bridge and its upper point, that Newcastle Bridge is thereby proved to be a cause of obstruction?—I should take it from that to be a part of the cause of obstruction between Bill Point and Newcastle, because the resistance of Newcastle Bridge would act as a cause for some distance below.

1872. As to the immediate increase beyond Newcastle Bridge, to what do you ascribe that?—To a wide tidal receiver, and a comparatively straight navigation; it opens out immediately you get above the bridge.

1873. Would an increased width of tidal basin increase the velocity of the tidal wave? —I can only speak to the fact in this case.

1874. And it is an increased width?—Greatly increased.

1875. Have you any soundings up the river which would show the effects which you seem to assume have resulted from the projecting piers near Hebburn Quay? have you any soundings of the bed of the river below that point which would enable you to form a clear, positive opinion of the effects of those projecting piers?—The whole of this diagram is constructed from Mr. Rennie's section, and the 1849 section repeated.

1876. But this is a very long way below Hebburn pier?—This information I obtained from repeating Mr. Rennie's section between these two points (*showing the same*).

1877. But the chart which we have above is the only thing which gives us information? —It shows the channel in 1854.

1878. (*Captain Fitzroy.*) You referred to the piers just now; taking it as a general question, do you think that the projection of piers of any kind may be an advantage, or would they, in your opinion, be a disadvantage to the harbour and river? would the effect of those piers be to diminish the river within the Narrows, or to increase and improve it? —I do not think they would have any effect of that sort.

1879. In which way?—I do not think they would either improve or disimprove; in other words, I do not expect that they would make any alteration in the amount of tide admitted or rejected.

1880. You think that the tidal wave, as it comes round from the north and east, would flow into the entrance and up the river with as much facility if those piers were constructed, as it does now while there is an open funnel, as it were, to receive and conduct the tide?—Yes; and as the erection of the piers would correct a confusion of sets which exists at the present time, I think there would be an improvement; in the flood-set especially.

(*Mr. Webster.*) Sir, before my learned friend proceeds to call Mr. Brooks, I should like to make an application to the Commissioners of this nature. I have now done the best I could for the minority, with such materials as they had in their hands. They are most anxious that Mr. Rendel should be called before you at some time or other. You will remember his peculiar position. He was applied to by the Corporation of Newcastle, the then Conservators, in the autumn of 1848. His report was not made until October 1851; that was after the new Conservators came into operation, and there have been most elaborate documents furnished with it. Mr. Rendel gave evidence on the Shields Bill of 1849, for the Corporation of Newcastle, in opposition to that Bill, and in so far as the information then afforded, it was generally in support of the views of the Corporation upon the question of the river. Since that time, Sir, I believe Mr. Rendel has never been examined on the subject, the matter has been left entirely in the hands of Mr. Brooks, who was then the Corporation engineer, and is still. The minority think it of importance to have the evidence of Mr. Rendel coupled with those documents which were prepared under his superintendence, in fact, which were a repetition of Mr. Rennie's survey, because he went upon that, as appears from the evidence which he gave for the Corporation of Newcastle in the House of Commons, in opposition to the Bill of 1849, of which there is a short print, which was printed from the "Newcastle Guardian" at the time. Mr. Rendel thought it his duty to repeat Mr. Rennie's observations as closely as possible, and to lay them down on charts and documents, which are now in the possession of the Conservators, and in addition to that, to make, I believe, a very elaborate series of tidal observations. Of course, those materials are not at our disposal, and it is not in our power, as the minority, to bring all these documents before you; it is quite out of the question. This was a matter, to a certain extent, discussed at a meeting of the Commissioners, when a motion was made on behalf of the minority, that some facilities should be afforded to bring information before you. That of course was rejected. Therefore, the minority have only been able to bring the matter before you in the way they have done, in the best way they could. My application therefore is (and I make it now, because you are about, I understand, to lose the presence of Mr. Brunel) on behalf of the minority, that at some time or other you will, before you come to a conclusion, have Mr. Rendel before you, and if I can be of any assistance in examining him in the way that I have examined Mr. Calver, I am sure the minority will instruct me to attend.

(*Chairman.*) I quite feel, certainly, that we should have Mr. Rendel before us, and I quite feel that the gentlemen on either side should be present at his examination. Will that satisfy you?

(*Mr. Webster.*) Perfectly, Sir.

(*Chairman.*) What does Mr. Seymour say.

(*Mr. Seymour.*) I leave it quite in the hands of the Commissioners.

(*Mr. Webster.*) Our object must be to get full information, that the matter may be settled once for ever. I am quite sure that if my learned friend or myself can afford any assistance in presenting the different views, it will be afforded.

(*Mr. Seymour.*) Perhaps I might mention that the witness I am now going to call is Mr. Comrie.

Mr. A. Comrie.

27th January 1855.

Mr. Alexander Comrie, sworn.

Examined by Mr. Seymour.

1881. I believe you are the son of the late Mr. Alexander Comrie, a marine surveyor?—I am.

1882. Did your father assist Mr. Giles in making the survey of 1813 for Mr. Rennie?—Yes.

1883. Was your father employed by Mr. Rendel in the year 1849, to re-survey the river between the bar and Newcastle bridge?—He was.

1884. Did he then prepare a plan showing soundings?—Yes, a plan showing the same soundings taken in the same parts as in 1813.

1885. Was your father in the course of last year employed by the Tyne Commissioners to go through the soundings which had been taken in 1813 and 1849?—He was.

1886. Was he also instructed to take new soundings on the same lines?—Yes.

1887. In what time of last year was that?—In September; from September to the end of the year.

1888. Did you assist your father in the preparation of those surveys?—Yes, I was present with him when he took the whole of the soundings.

1889. And you assisted him in doing so?—Yes.

1890. Were you with him during the taking of the last soundings?—Yes, and also in 1849.

1891. What sort of season was the autumn of last year with regard to dryness?—It was one the dryest that has been known for many years. I may say that we had scarcely a wet day during the whole time that we were taking the soundings; we were not delayed certainly a day the whole time.

1892. I believe on the map the soundings of 1854 are marked in red ink?—They are.

1893. And of 1849 in black?—Yes.

1894. When did you sound the bar?—The last week in September 1854.

1895. The soundings were continued in the close of last year up to December?—Yes.

1896. Does the peculiar dryness of the weather apply to the time when you were sounding the bar?—It does.

1897. These are the maps of 1849 and 1854?—Yes.

Cross-examined by Mr. Webster.

1898. The survey which commenced in 1849 was under the direction of Mr. Rendel, was it not?—It was.

1899. I think it commenced in March 1849?—Yes; in March or April, I am not sure which; in March, I think.

1900. It is stated in Mr. Rendel's evidence that it was in March 1849; it commenced in March 1849?—Yes.

1901. The soundings you took then under the direction of Mr. Rendel?—Yes.

1902. Was it part of Mr. Rendel's instructions to your father that he should repeat every sounding which was taken by Mr. Rennie in 1813, or that appeared upon his chart?—Not in his first instructions; he gave a second set of instructions, desiring my father to take every section, which was done.

1903. Your father did repeat, under the instructions of Mr. Rendel, every sounding that appeared upon Mr. Rennie's chart of 1813?—He did, with the exception of those between Prior's Stone and the bar.

1904. Were those soundings so taken laid down upon Mr. Rennie's chart or upon a chart of the same dimensions?—No, they are laid down here; the soundings in 1849 are in black, those in the autmn of the last year in red.

1905. Was this the identical chart which was furnished by Mr. Rendel to the Conservators?—It was.

1906. And upon this chart you have laid down the soundings that were since taken in this last autumn?—Yes.

1907. What were the instructions which your father received from the Conservators as to these soundings?—That he should repeat the whole of the soundings which were taken in 1849 in the same lines.

1908. Was it by letter?—My father received a letter from Mr. Clayton desiring him to come to Newcastle as soon as possible; I am not sure as to the soundings.

1909. What was the date of the first letter which your father received from Mr. Clayton or from anybody else upon this subject?—I have not the letter with me.

1910. You can get it, probably?—Yes.

1911. It was subsequent to the 14th of September, I suppose?—Yes; I think it was.

1912. Probably you are aware that this is a matter which was discussed at the meeting of the Commissioners on the 14th of September 1854, on the occasion of the notice of motion for the Royal Commission?—No, I do not know.

1913. You have not with you the first letter which was received?—I have not.

1914. Do you know whether that letter contained the instructions upon which your father proceeded?—I think not.

1915. Then what were the instructions, or when given, upon which your father proceeded?—The instructions given by Mr. Clayton when he arrived in Newcastle.

1916. Verbally?—Verbally, I suppose. I do not know whether instructions were given in writing or not.

1917. Then, so far as you know, the instructions given to your father, upon which this further survey was made, were given verbally by Mr. Clayton?—Yes, as far as I know.

1918. Do you know whether Mr. Comrie was then acting under Mr. Clayton's instructions, or under Mr. Brooks'?—Under Mr. Clayton's, I think; he was acting more in conjunction with Mr. Brooks. I fancy both under the Commissioners.

1919. You understood they were both under the Commissioners; but so far as you know, you do not happen to know whether what Mr. Comrie did was under the instructions of Mr. Clayton, or under the instructions of Mr. Brooks?—No, I do not know exactly.

1920. In 1849, I believe, there were a very elaborate series of tide observations?—I think there were.

1921. Do you happen to know how many there were?—No.

1922. But a great number?—Yes.

1923. Were they carried on by your father, or whom?—Most of them were carried on under his direction.

1924. Can you give me any idea of the number of them, or what was done with reference to them?—No; I was more as an amateur in 1849, though I was here. I cannot speak with regard to tidal matters.

1925. You cannot give any information about the tidal observations?—No.

1926. Did you make any tidal observations this last autumn?—There were some made.

1927. Who made them?—Mr. Brooks, I think.

1928. You do not speak to any tidal observations made this last autumn?—No.

1929. Do you know whether any such have been furnished to the Commission?—I do not.

1930. The survey, I think, in 1849, was a survey begun in March, and continued during the summer, was it not?—It was.

1931. When did that season terminate?—Some time in September.

1932. So that the survey of 1849 was a survey continued from March to September?—Yes.

1933. The survey of last year was a survey beginning in autumn, and when terminated?—In December; but the survey in December was not a land survey, but merely a repetition of the soundings. The survey in 1849 was both a land and a marine survey. By a land survey I mean the outline of the shore.

1934. Then so far as regards this recent survey, which commenced in September and ended in December, there was no land survey, that is to say, the outline of the shore?—No.

1935. (*Mr. Brunel.*) In the original survey of 1849, were the soundings commenced at the early part of your survey, or did you begin by making a plan and then go on with the survey?—Some soundings were taken previous to the making of the plan and some afterwards.

1936. Were the great bulk of them made afterwards or before?—They were taken afterwards.

1937. At what period of the year would they be principally taken?—Possibly in August and September, the greater part of the soundings.

1938. And those of last year would be taken in September and October?—Yes; in fact, the whole time from September to December.

1939. The tides which were going on during September, when you made your last observations, would be what you would call equinoctial tides, would they not?—Yes, they would.

Re-examined by Mr. Seymour.

1940. When were the soundings on the bar taken?—They were taken on the 13th and 14th September, the principal part of them; some were taken on the 15th of September; that was just about a week before the equinoctial spring tides.

1941. (*Mr. Webster.*) You say some were taken on the 13th and 14th; what proportion were taken on those dates?—The whole were taken on the 13th, 14th, and 15th.

1942. (*Chairman.*) So that that was before the equinox?—It was.

1943. Do you recollect what sort of weather it was?—Very still weather.

1944. (*Mr. Webster.*) Who were the actual persons who took them—who were present when they were taken?—A man named Blackett, of Shields, took them.

1945. But your father and you were present?—Yes.

1946. And nobody else?—Nobody else.

1947. Were they taken by cord stretching over the river, or how?—Those over the bar were taken by sextant angles.

1948. (*Mr. Seymour.*) Did you try the force of the current?—Yes; we did in Shields harbour.

1949. What was the effect?—We found the result to be on the ebb tide about $3\frac{1}{2}$ knots per hour.

1950. (*Mr. Armstrong.*) At the Narrows?—No; at Shields harbour.

1951. (*Mr. Webster.*) At what time of tide?—About first quarter ebb.

1952. (*Captain Fitzroy.*) How did you measure it?—By the points on the shore and on the plan. We saw the distance on the plan, and calculated it; passing different points, for instance, the New Quay point and so on.

1953. The time occupied in passing different points?—Yes.

1954. In a boat?—Yes; we had a float besides.

Mr. A. Comrie.
27th January 1855.

1955. (*Mr. Brunel.*) With respect to these observations upon the velocity of the tide in Shields harbour, did you try further up the river, so as to get the average velocity?—No; it was down the river.

1956. In the stream?—Yes.

1957. With respect to the soundings over the bar, were they referred to a datum point?—Yes; to the same datum.

1958. Therefore, whether it was a spring tide or neap tide, or equinoctial or not, would make no difference?—Not at all; they were all referred to Mr. Rennie's datum, a mark on the Low Lighthouse.

1959. Therefore, the depths of water which you give are, in fact, the vertical measurements from the level of some mark (I believe Mr. Rennie's datum) down to the ground of the bar?—Yes.

1960. And not affected in the least by the question of whether you took them at high water or low water?—Not the least.

1961. Or whether it was spring tide or neap tide?—Not in the least.

(*Mr. Webster.*) This gentleman did not make the reference.

1962. (*Mr. Brunel.*) How were these soundings taken?—With a lead line on the bar.

1963. By whom?—By the best man we could possibly get at Shields; an old man-of-war's man, a regular man for taking soundings.

1964. Did you take anybody with him?—Both my father and myself were with him. My father looked at him when he took them, and I put them down in the book.

1965. Then, in fact, your father took them?—Yes; he saw the man take every sounding. He may be said to have taken the soundings himself.

1966. In fact, as an engineer or a surveyor would say, he took the soundings himself, though he did not hold the lead line?—Yes.

1967. And you took a note of the same?—Yes.

1968. What means did you adopt to ascertain the level of the water at the same moment at the tide gauge?—There was a man placed at the Prior's Stone at the tide gauge with a watch regulated by ours, and he took the tide every five minutes.

1969. Measuring it from the top of that rock?—Yes, from Mr. Rennie's datum.

1970. You say Prior's Stone, did he do it at the stone?—At the stone.

1971. (*Captain Fitzroy.*) Did you use a lead line, or a pole?—A lead line on the bar, a pole in the river.

1972. Was the length of the lead allowed in the measurement of the line?—The lead line was measured almost every night.

1973. When the soundings were taken, when the lead plumbed on the bottom, was the length of the lead itself allowed in the measurement of the line or not?—I do not quite understand the question.

1974. (*Mr. Brunel.*) Of course the depth would be measured from the bottom of the lead, as hanging perpendicularly, up to the mark on the lead line?—Yes.

1975. Do you know, of your own knowledge, whether the length of the lead was included in the measurement?—Certainly.

1976. (*Captain Fitzroy.*) Are you aware that it is not so in the ordinary lead lines used at sea?—I am not.

(*Mr. Webster.*) Will you ask him, Sir, whether these were taken at ebb or flood.

1977. (*Mr. Brunel.*) At what time of tide were they taken?—They were taken on the ebb tide, very nearly low water; in fact, the object was always to get as near low water as possible.

1978. (*Mr. Webster.*) Was there any allowance made for the slope of the surface between the Prior's Stone and the place where the soundings were taken?—No; there was no allowance made.

1979. (*Captain Fitzroy.*) Is the bar very uniform in its surface in the channel? Is the channel across the bar of uniform depth, or irregular?—It is generally, I think, uniform.

1980. Would the difference of a ship's length on one side or the other of the deepest water line make a difference in the soundings?—I think not.

1981. How wide do you take the deep-water part of the bar to be in fathoms?—I am unable to speak to that precisely; the engineer will be able to do that.

(*Chairman.*) We think that Mr. Brooks had better give his evidence as much as possible in the form of a narrative.

W. A. Brooks, Esq.

WILLIAM ALEXANDER BROOKS, Esquire, sworn.

Examined by Mr. Seymour.

1982. ARE you the engineer of the Conservation of the Tyne?—I am. I was also engineer to the former Conservators from the year 1842. I now produce plans, which belong to my office of engineer to the Commissioners. I first produce a plan by Fryer, the date of which is 1782, which contains a series of soundings taken at low water. The original plan extends from Hedwin Stream, which is the limit of the tidal flow, down to the bar, and I put in at the same time a reduced plan of that survey from Newcastle Bridge to the bar. Beginning at the bar, I find the depth shown at low water is 7 feet, and the greatest depth in Shields Harbour is 20 feet, that is, at low water. Proceeding up the river I find, abreast of Jarrow Quay, a wide expanse of very shoal water, varying from one foot to

four, and extending three-fourths across the river, that is, from the south to the north, showing that the entire region on the Jarrow or south side was one mass of shoal water. *W. A. Brooks, Es* 27th January 1855.

1983. (*Chairman.*) This was when?—In 1782. Then abreast of Howdon, where a 4 feet depth of water has been previously referred to in the evidence as existing, I find only a depth shown of 2 feet, being about the depth given by witnesses at previous inquiries. At that time the navigable channel in the vicinity of Hebburn lay very near the south shore, and it is rather an extraordinary circumstance that nature at that time appears to have done what has been attempted to be executed; in fact, it has been executed by the works of the Commissioners and by the old Corporation, that is, to shut out the channel through Wallsend Bight; there was no passage on the north shore through Wallsend Bight extending from the Walker shore down the river; it covers up the passage about Wallsend Bight. I now put in the plan of the Commissioners, made for Mr. Rennie in 1813 by Giles and Comrie, which was found in my office when I came to it. I also put in the plan which accompanied my report of 16th January 1843, showing upon it the river lines which I then recommended to the Conservancy of the navigation, namely, the Corporation of Newcastle; that was made in the end of 1842. That plan has upon it two lines, one representing those designed by me, and the other representing the lines of the late Mr. Rennie; they were taken from Mr. Rennie's plan. This plan is in a very dilapidated state, because it was used at every meeting of the former Conservators; in former years it was taken down the river and very much abused. I lay before the Commissioners the report which accompanied that plan; that plan contains certain deviations from Mr. Rennie's lines; my report states, "It appears that when the late Mr. Rennie was called upon "to give his views for the improvement of the Tyne, its banks were not at that time so "much covered with manufactories, commercial establishments, and coal staiths as we find "them at the present day, and it was probably owing to that cause that we find on several "portions of his plan evidence of his opinion that the establishments which existed were "not of sufficient importance to cause him to revolve in his mind whether the removal of "the shoals could not be effected by a different disposition or arrangement of the works "to form the improved sailing course. Hence we find upon Mr. Rennie's survey only two "shipping places for coal on the long line of shore between Howdon and Hay Hill Point, "where at present there are eleven staiths, the whole of which would have to be carried out "into the river for an average length of 363 feet, in order to reach the line of northern shore "proposed by Mr. Rennie. Now, if it were really essential, in this instance, to adhere to "the above line of northern shore, in order to effect the general improvement of the "navigation, there could be no impropriety in calling upon the several proprietors of the "above staiths to extend them to the line on Mr. Rennie's plan. From the commencement of my duties as an engineer to the Corporation, my earnest attention has been given "to this question, and the conclusion which I have arrived at is, that it is not in this "division of the river at all requisite to adhere to the shore lines marked out by the late "Mr. Rennie, between the works at Willington and Hay Hill Point. All that is truly "requisite for the improvement of the navigation here is fully to carry out his principle "of leading the currents of ebb and flood into a single channel." This report goes on to show that in order to keep deep water at the numerous staiths which had been erected subsequent to Mr. Rennie's time on the northern shore at Hay Hole, it was requisite to change his plan, and for that purpose, I recommended works to be erected on the southern shore, to turn the main body of the ebb tide on to the north side, instead of on the south side, as shown in his plan. When I entered upon my duties of engineer to the Conservators, I found that certain works were then being carried out upon Mr. Rennie's line. A quay or groin was in progress at Willington, and the effect of that was greatly to change the channel or shoal the water in the neighbourhood of Hay Hole, and if that work had been persevered in, and Mr. Rennie's lines had been strictly abided by, the result would have been the entire closing up of the Hay Hole Channel, where there are about a million tons of coal shipped every year. This would so seriously have endangered the welfare of the port, that I, in that report, pressed strongly upon the Corporation, the then Conservators, that that plan which was made by Mr. Rennie should be deviated from. The result was, that after much discussion the Corporation changed their views, and adopted my report with reference to that part of the river, and subsequently certain works were constructed in the bight above Jarrow, with the intention, as I before stated, of throwing the water on to the north shore. I would observe that at the time of my commencing my duties, a sand had grown up on the north side, blocking up the Hay Hole Channel, and I now put in a plan of the river from White Hill Point to the neighbourhood of Hebburn, in which I have shown in red lines the condition of the river in subsequent surveys. That was made in 1844, before these works were commenced for altering the channel, which shows one mass of sand, extending two thirds across the river from the north towards the south side, being many acres in area. The region of shoal water, which dries at low-water spring tides, extends in the direction pointed out by this line; the whole of the space shown being dry at low-water spring tides. There is a small channel of about 15 inches at low water, so that I may truly say it is one mass of sand on the north shore, from the Seaton Delaval estates up to Howdon Dock. Subsequently works were constructed in Jarrow Bight, which were not commenced, however, till 1848, and which were finished in the November of that year. Two jetties were erected, and the effect of that was to cause an immediate alteration in the state of the navigation; the

W. A. Brooks, Esq.

27th January 1855.

channel, which had been closed against the passage of the ebb-tide through the Hay Hole channel was re-opened out, and the plan which I shall subsequently produce shows a totally altered state of things resulting from the work projected by me, showing that the establishments at Hay Hole were prevented from being utterly ruined. If those works had not been constructed in the Jarrow Bight, the result would have been that the great mass of sand would have risen several feet higher, and I believe it would have been quite impracticable for the parties shipping in the Hay Hole to carry on their trade. At this stage of the proceedings it is necessary to point out how that affected the condition of the landowners on the south side. It must be evident that at the time when those sands existed on the north side, the parties at Jarrow Quay shipping coal or other things had deep water along the whole of that shore, and it was held out to the proprietors of the land on that shore, that if they consented to the change of the direction, that is, to allow the formation of works on their shore, instead of on the opposite one, they would then have the land lying between the new line of shore and their quays, in consideration of the little temporary injury and damage which they would be put to by the change of the channel. It was, in point of fact, a question whether one very great interest should be ruined on the north side, or a small interest should give way. A plan was given in to one gentleman, namely Mr. Brown, who owns a large tract on this shore, showing the extent of land which he would gain, supposing the navigable channel were turned to the north side. Now the result of carrying out those works, while it has given deep water on the north side, has certainly caused very great inconvenience to the parties on the south side, and amongst them the Chairman of the present Commissioners, who has been a very great sufferer, frequently complaining quietly, but never putting strongly forward his claims; and at this very moment his establishment is in a very bad condition, and has not been dredged, though it wants it very materially. Other claims have been acceded to before his. This meets the objection which was raised of giving parties land out of the navigation in one of the complaints which I have heard before this Commission. Now at the present moment, the parties who have that shore are again disappointed, because, after having had all this inconvenience for some years, the water shoaling, while the water on the north side has got deeper, the state of things is now totally changed. The Commissioners have agreed to make a wet dock, and are now making a wet dock on the north side of the river, which will restore the river, in point of fact, to the condition as previously recommended by Mr. Rennie, that is, the part of the Hay Hole Bight included between Hay Hill Point and Willington Quay will be thrown into a large wet dock, containing 66 acres of water, and the parties on the south side will get no land. They have suffered inconvenience, and are now, we may almost say, defrauded of the expectations which were held out to them. This survey will show what was the state of the river in the neighbourhood of Black Staiths. A large mass of sand existed abreast of what is called Muckhouse, the ebb tide from the shore near Wallsend, towards Black Staiths, deflected to the north side, left a mass of sands, which was dry at low-water spring tides, about 3 feet 6 above low water, which at the present moment appears by the soundings to have totally gone away, and there is deep water at that place. In the early part of my employment under the Corporation, there was a very bad shoal existing near Hebburn Black Staith, which was known by the name of Killingworth Shoal, that remained for several years; it had on it not more than 2 feet water at low water. I frequently grounded in a small steam-boat, drawing 3 feet, and remained there an hour or an hour and a half. I have seen 9 or 10 small river steam-boats a-ground there at the same time, and lying there a considerable period. That was caused by the channel changing abruptly from the north side to the south. Whenever you find the channel of a river change from one shore to the other abruptly, the worse will be the nature of the shoal, because whatever may be the apparent breadth of the river at the spot in question, the actual breadth of the current in traversing that space will be of course at right angles to the line of the direction of the current; so that if you take it as I now point out on the plan, going from the north side to the south, the apparent breadth as shown here upon the plan becomes very much greater than the positive contracted breadth. Higher up Hebburn Shoal is in the same condition. When I entered upon my duties, and for many years afterwards, the direction of the current of the ebb after leaving the Bill Reach was along the south or Hebburn Quay side, and then it changed abruptly towards the north, and the consequent effect was that there was only two feet water at low-water spring tides there. I know that that depth existed as far back as 1832, for I examined the river. Hebburn Shoal was the standing grievance in the Tyne at the time I came; it was the governing shoal. The Tyne Main Shoal, on which I grounded in 1832, had disappeared at that time; it was formerly the worst shoal in the river, though it does not appear at all upon Mr. Rennie's plan, any more than Howdon Shoal. Howdon Shoal appears to have lain between two lines of soundings, just the same as Tyne Main Shoal; it is notorious that Tyne Main Shoal existed as well as Howdon Shoal. The line of soundings being three chains apart, it may be very easily conceived that shoal water might escape observation; it could not escape the keel of a steam boat when passing through it. That was the case on the north-east side. (*Another plan was produced.*) At the time of entering upon my duties under the old Corporation of Newcastle-upon-Tyne, a very bad sand existed in the Walker Reach, which is shown upon Mr. Rennie's chart, and also a bad sand existed, called Bill Sand, in the reach above Bill Point; it is shown very strongly upon Mr. Rennie's chart, but is not upon this one, for this plan was made after

that sand was removed. There is a small plan, which I think will show the nature of it better than referring to a very large plan. This is a reduction of Mr. Rennie's chart, which, if I had not been called upon so early to give my evidence, I intended to put in with soundings in addition to the contour lines laid upon it.

W. A. Brooks, Esq.
27th January 1855.

1984. (*Mr. Armstrong.*) How long will it take you to do that?—I shall be able to get it put in on Monday, but I now place it before the Commissioners. The shoal at Bill Point is shown upon it. The darkest blue shows the pools which had in them 19 feet at high-water spring tides; the medium shades of blue shows the parts of the river which had 17 feet, that is, assuming that there was 4 feet existing over Howdon Shoal, though previous evidence has been advanced that only 2 feet existed, but in this case I have taken it for granted that no Howdon Shoal really existed, or that there was full 4 feet through it. The lighter blue shows the portion of the channel which had 15 feet upon it, that is, assuming that over every shoal there was 15 feet water. In fact, these lines have been traced through the 15 feet soundings upon the plan. To distinguish the two shoal parts of the river, as existing at that time, I have used two shades of colour, one purple, which shows the part which was shoal, but did not dry at low water; then the lighter shade, the very light purple, shows the part which dried at low-water spring tides. All these have been carefully traced through the soundings on Mr. Rennie's plan, which has the marks upon it. That is the plan which I have already given in evidence. I have made this of convenient shape for the use of the Commissioners on any future occasion. This plan, too, does not show, I observe, any shoal at Tyne Main. I have written the word "shoal" upon it, though the soundings will not show that there was, in fact, less than 17 feet; but it is notorious that the depth upon that was less than at Hebburn Shoal, where the utmost depth was 15 feet at high water; the rise of tide upon that part was 11 feet 6, and it was 2 feet at low water; 13 feet 6 was the greatest depth at that part. I know that from my own observation in 1832. In 1847 works were executed in the bight above Bill Point, where a very tortuous navigation existed. There was deep water along the northern shore, but it was narrow and very dangerous—so dangerous, that I remember as a fact that two vessels could not safely pass each other at the same time. Those works are referred to in my report of January 1843. They were subsequently executed; they were commenced in October 1847, finished in about two months, cost about 800*l.*, and their almost immediate effect was to drive away that sand which existed opposite Bill Point in the channel. The form of that shoal does certainly still exist, but there is deeper water over it; and I can only have occasion to refer to the evidence given by Mr. Calver upon this part of the river, where he says that now the navigation is exceedingly easy there. It is improved as to depth, and also as to straightness. The Tyne Main Shoal had been removed by the former Conservators before I commenced my duties. Certain dredging took place, a quay was constructed on the south side, and it has not since been complained of. That is an improvement, of course, effected in the navigation. Whatever may be its present state, you will have to contrast its condition with the governing shoal, which had only 13 feet 6 inches upon it at high water of spring tides. I now place before the Court another plan, being a reduced chart of the River Tyne, from the survey made by the late Mr. Comrie in 1849; it is in the same state as regards the previous plan; but I shall produce this plan, or a copy of it, on Monday, with the soundings put upon it, and shall verify them. This shows the state in 1849, when Hebburn Shoal still existed, the same as is shown upon Mr. Calver's chart of the same year. Mr. Calver shows, however, in his survey, rather a greater depth of water, a few inches more upon it than Mr. Comrie shows; however, the depth then was about 15 feet 10 inches. Walker Sand had been partially acted upon by works which had been previously constructed on the south side of Bill Reach, and one or two on the north; but it was not effectually removed. At that time the channel still took the same tortuous direction across Hebburn Shoal from the south to the north. I made frequent reports to the present Conservators, urging the propriety of expecting effective works on the south side, on the Hebburn quay side, to force the channel into its natural course on the concave shore. Now it is rather an extraordinary circumstance, quite unusual to what marine surveyors will find, that the deep-water channel should exist in what is apparently a convex shore; but that is a fact proved by all the old surveys. You would naturally expect that the tide, after leaving the deep bight at Bill Point, would have shot over to the north side, leaving Hebburn Quay Shoal. I believe that was due to a projection which existed in the line of quays at Wincombe Lea, and which, perhap originally caused the formation of this Walker Sand. The consequence was, tha there was a deep hole, useless to the navigation, but which kept the channel on the south side. If that pool had not existed to the extent which is shown, the jetties made by me, which are shown upon my plan, or agreeable to the river lines, would have been quite sufficient to have turned the flow of the tide into the required direction; and it was, therefore, that I was compelled to request that those jetties, as a temporary measure, should be extended to force the water more to the north side, and cut out a channel through the Walker Sand, making the deep-water current through what ought to have been its natural course. After very much opposition, that wish of mine was gratified. I was enabled, temporarily, to extend the jetty at Hebburn Quay 100 feet beyond my own river line, and the jetty westward 66 feet. That produced a very great change for the better, but did not effectually remove the grievance; and then it was, that I urged upon the Commissioners to proceed with the execution of the other jetties on the Hebburn Quay side, which were mentioned in my report of January 1843, which at that time had not been executed; those

W. A. Brooks, Esq.

27th January 1855.

jetties were made, and ultimately extended beyond the length which I originally intended; the result was, that Hebburn Shoal was effectually removed. After those jetties were made, no dredging ever took place upon Hebburn Shoal. I state that positively. Hebburn Shoal was effectually removed, and at a comparatively small cost, because a fortnight's dredging cost the Commissioners, and has frequently cost in this very spot, at least 160*l.* Now these jetties are only made of timber; they consist of a few piles and three-inch planks to close the passage of the water; it is an exceedingly cheap mode of changing the current of the water. I believe it has not been practised in any other place, excepting by myself previously in the Tees, where I had effected a considerable change in the state of the navigation, reducing the low-water surface about 3 feet, and enabling large ships to get up to Stockton. There no training walls, as they are called, were made, just in the same way as no training walls were made above Bill Point, between the three jetties shown on the plan; a low wall was made subsequently from the outer point of the lower jetty in the direction of Bill Point, because I felt that if any accident should occur to any ships getting upon the Bill Point, after the execution of my works, I no doubt should have a loud outcry against me that those works had been the cause of it. The result is, that no vessel has ever known to be damaged upon the Bill Point, which was left by my predecessor as a sunken rock; it had been excavated about 70 feet from the south towards the north, to cut it down to low water at extreme low ebbs—in fact, 6 or 8 inches below low water; it was a shaley sort of sandstone, and easily worked up by picks. I now place before the Commissioners a tracing of Mr. Calver's recent survey of last summer, which extends from the west end of Hebburn Quay to the middle jetty of the Wallsend Bight. The depth shown on Hebburn Shoal appears to be above 5 feet. I will just read over the soundings, where the shoal existed on each line at low-water spring tides. The western line, 5 feet 6 inches, 5 feet 6 inches, 5 feet 6 inches, 5 feet 9 inches, 6 feet 3 inches, 6 feet 9 inches, 6 feet 6 inches, 6 feet. The next line to the eastward, 6 feet, 6 feet 6 inches, 6 feet, 5 feet 6 inches, 5 feet 6 inches, 6 feet, 6 feet. Then the line a little lower down to the east, 6 feet 6 inches, 6 feet, 5 feet 6 inches, 6 feet, 6 feet 6 inches; then there is 4 feet 6 inches on the south side, and 5 feet 6 inches; but 6 feet 6 inches is the depth in the channel. The next line of soundings, which is opposite the groin which lies beween the east end below Walker Quay and Coxlodge Staiths, is on the north side of the channel; 10 feet 3 inches, 7 feet 6 inches, 7 feet 6 inches, 6 feet 6 inches, 6 feet 6 inches, 6 feet; 5 feet 6 inches, 5 feet 6 inches, 5 feet 6 inches, 6 feet, 6 feet, 6 feet 6 inches, 6 feet, 5 feet 6 inches, 5 feet 6 inches, 4 feet 6 inches, 4 feet 6 inches, 4 feet; the last soundings being half-way across the river. The next sounding shows deep water from 8 feet 6, to 7 feet, and extending about half-way across the river, till Mr. Calver gets to the general range of his 4 feet contour line. The soundings in the channel below are also in the same way. There is no shoal existing in Coxlodge. In fact, it shows an improved navigation considerably broader than the channel which existed in my own time round Wallsend Bight. I now put in another plan furnished to me by Mr. Calver yesterday, upon which he has given evidence, and upon which he was cross-examined by my learned friend. This plan (*pointing to an enlarged chart by Mr. Calver placed against the wall*) shows only 3 feet 9 inches in the present navigable track opposite the lower end of Jarrow Quay, and I maintain that Mr. Calver's own survey, as furnished to me, shows a greater depth, it shows 5 feet throughout. It is true, that this is a little more to the north; but I appeal to any member of this Commission, whether I am not perfectly correct in my statement. I have marked in pencil lines the course which a ship should take, and I will read the soundings; I will read the three soundings in the vicinity of this track. On the western line of the shoal, over the same place, there may be the 3 feet 9 inches, if you go more to the south; but going a little more to the north I find on the western line 7 feet, 6 feet 6 inches, 6 feet 6 inches, 7 feet, 5 feet 6 inches, 4 feet 6 inches. Then I come to the 3 feet 9 sounding, which is more to the south. I have a greater depth than he shows, because I have in the deepest track 7 feet there. Then the next line of soundings begins at 4 feet on the north, and then goes towards the south with the following figures:—5 feet 5 inches, 5 feet 8 inches, 5 feet 8 inches, 5 feet 8 inches, 5 feet 8 inches, 5 feet 8 inches, 6 feet, 5 feet 11 inches. I have now measured what is called the channel, but still deep water continues. 5 feet 8 inches, 5 feet 3 inches, 6 feet 11 inches, 7 feet 11 inches, 9 feet 4 inches, 9 feet 5 inches, 9 feet 8 inches, 10 feet 8 inches, 10 feet 9 inches, 9 feet 5 inches, a deep-water shore. The next line shows from the north side 5 feet 3 inches, 5 feet 3 inches, 5 feet 9 inches, 5 feet 9 inches, 5 feet 3 inches, 5 feet 3 inches, and 6 feet 6 inches. Then the statement which I have to make is, that a vessel in passing across this line of soundings would not encounter a less depth than I have shown here of 6 feet 6 inches. Unless Mr. Calver has got other evidence to advance, showing that he found shoaler water on the part where he has traced his 4 feet contour lines, unless he can advance other soundings, proving that shoaler water is found in it, these soundings demonstrate that not less than 5 feet 3 inches exists in that direction. The contour lines are supposed to be traced through the soundings. I respectfully contend that that is not proved by those soundings. I can only be wrong if Mr. Calver produces fresh soundings. I say those soundings do not support Mr. Calver's plan; they do not support the depth of water which he maintains to have existed on the shoal. That is a copy of Mr. Calver's survey, which he furnished to me. If Mr. Calver can show that he has taken other soundings, then of course I must rest my case as to the existing state of the navigation upon some other survey.

EDWARD KILLWICK CALVER, Esquire, R.N., further examined.

E. K. Calver, Esq., R.N.

27th January 1855.

1985. (*Mr. Brunel.*) WILL you have the goodness to look at that chart of the channel in 1854. Have you the soundings from which it was made?—I have.

1986. Will you have the goodness to show them?—(*The Witness produced the same.*) The soundings which I have supplied to Mr. Brooks are those in red ink upon Mr. Rennie's line, but they really are only altogether about half what I took.

1987. It is a pity you did not give them all?—They must needs be on Mr. Rennie's line to form a subject of comparison.

1988. If they give information as to the form of the river, it is no matter whether they are on Mr. Rennie's lines or not; they supplied you with the means of making a chart, comparing it with Mr. Rennie's. Will you have the goodness to point out to the Commissioners the soundings which form the data on which the 3 feet 9 shoal is shown?—(*The Witness pointed out the same.*)

1989. Will you point out what there is between a certain point marked 6 feet 6 inches, which I see on one line, and a certain point marked 5 feet 8 inches in red ink figures, to show that there is anything shoaler between those two points?—Not on that; I have lined them in from the soundings which you see.

1990. We will imagine a vessel to be in the soundings which I see here marked 7 feet 6 inches, we will imagine her then to pass to the point where I see 6 feet 6 inches. Is there any thing apparent on this chart to show that she could not go there?—Nothing; she would go from 7 to 7.

1991. From that 7 to that 5 feet 8 inches, is there anything to show that she could not pass there?—Not in the sounding; it is a matter of lining in.

1992. Soundings are what are taken on the spot; you then go home and "line in," as you call it?—Yes.

1993. But we will be content with the soundings. As far as any measurement was taken, there was nothing to prevent a vessel going from the 7 feet to the 5 feet 8 inches?—The nature of the measurement induced me, of course, to line in in this particular form.

1994. Is there anything on the soundings of this chart, to show that a vessel could not pass from that 7 feet to that 5 feet 8 inches?—Nothing as soundings, distinctly.

1995. Is there anything then to show that she could not go to the 5 feet 9 inches in the next row of soundings?—Nothing.

1996. And after that she goes into deep water?—Then she goes into deep water.

1997. Therefore, as far as the soundings go, there is at least 5 feet 8 inches?—No; here is a simple illustration. I have a certain section here, and a certain section there, and I find a certain line of 4 feet cuts here, and I find 4 feet cuts there, and I then join the two.

1998. You may join it and mislead yourself by doing so?—Unless you are very careful, of course you will.

(*Captain Fitzroy.*) I am sorry to say that in many of our Admiralty charts at this moment great errors have been committed by laying down arbitrary lines of soundings, laid down in a room, and not depending upon actual soundings. I agree entirely with Mr. Brunel's view upon that point. There is nothing there to show that a ship might not go with 5 feet water from one point to the other.

(*Mr. Brunel.*) On the contrary, I believe a ship could go on the face of what I see there.

(*Captain Fitzroy.*) There is not the least reason why, because there is shoal water there, there should be also shoal water here.

(*Mr. Calver.*) It is a matter of experience, as the surveyor must know not only the soundings, but the particular feature.

(*Captain Fitzroy.*) I have had a great deal of experience as a surveyor, and the principle is an erroneous one. There is nothing in the general contour of those shoals to give you a right to draw the ridge there, or to assert that there are 3 feet.

(*Mr. Calver.*) Of course, it is a matter of lining in; but I may, perhaps, mention one thing in connexion with this; the dredger had just left that hole, where she had been dredging for 36 days. This is not a feature formed by the river, but the dredger was in that particular place for 36 days.

1999. (*Chairman.*) Because it was a shoal?—Because it was a shoal. It is a matter of easy proof. Of course, I shall be most happy to accompany the Commissioners; in fact, if anything, as a matter of fact, which I offer, is at all questioned, it will be a great pleasure to me to test it.

2000. (*Mr. Armstrong.*) It was a tracing of that which you gave to Mr. Brooks?—It was a tracing of part of it; those sections which were really Mr. Rennie's.

WILLIAM ALEXANDER BROOKS, Esquire, further examined.

W. A. Brooks, Esq.

(*Mr. Brooks.*) I NOW merely say, that Mr. Comrie's recent soundings show the same thing, that no shoal existed there. I may state that Mr. Comrie's soundings show that shoal water does not exist upon what Mr. Calver calls the new shoal, and I think that is established by the cross-examination of Mr. Calver, also because we have had it admitted that 18 feet at least, according to his showing, or 18 feet 6 inches, is the depth over what

W. A. Brooks, Esq.

27th January 1855.

he calls the new shoal; that is showing more than 4 feet water at low water, the rise of tide there being not more than 13 feet 6 inches.

2001. (*Mr. Webster.*) That was on the steam-boat sounding, you mean?—On the steam-boat sounding; but we have here accurate soundings taken by Mr. Comrie, Mr. Comrie's soundings in 1854; which confirm my statement.

2002. (*Chairman, to Mr. Calver.*) Are Mr. Comrie's soundings or yours the latest?—Mr. Comrie's.

(*Mr. Seymour.*) One is June and the other September.

(*Mr. Brooks.*) A little mistake has been made as to dates by Mr. Calver in his evidence. I shall be able to show that, when he shows upon his plans that the dredger was at work on the shoal at the time he made that survey; she was actually at work lower down. I believe that it is not necessary for me to enter at all at any length into the question as to the bar. Mr. Calver has stated, that he really meant only the navigable depth of the channel; that is, between the Spar Hawk on the north, with a 3 feet depth upon it, and the 3 feet depth on the south; and what we originally disputed about was that he meant, as he stated in his evidence, the sectional capacity or discharge of water.

2003. (*Mr. Webster.*) He never said discharge.—It is stated so plainly in his evidence in the blue book.

(*Chairman.*) He has explained that since perfectly.

(*Mr. Brooks.*) The previous witnesses have made many observations as to the improper conduct of the works, stating that they ought to have commenced from the sea or from the eastward, and to have gone upwards. I am anxious to put before the Commission that if that system of construction had been adopted it would have entailed very much greater expense upon the Commissioners. I can very strongly illustrate that, by reference to the first work which I witnessed on the Tyne, when I commenced my duties. My predecessor, Mr. Anderson, was carrying on a groin at Willington, and afterwards a wall going in a westerly direction, and he was carrying it what we call against the ebb; it was formed of rubble stones, and the effect was that the scour of the ebb tide striking against the work as it advanced, of course made a very deep hole, and caused a very much greater consumption of rubble to fill up that hole than would have been necessary if the works had advanced in a contrary direction, that is, from the west towards the east, or out of the range of the action of the ebb tide; therefore, a staith was erected upon this line at the west end of Willington Quay, it was closed with planks, and that had the effect of shutting out the tide from that space, and the wall afterwards advanced with less than one half the quantity of materials previously used. I may now take the opportunity of stating also, with reference to the construction of these jetties, that one great use of these works is this, if the river line be determined upon to be formed by rubble stone, or chalk, or any other material, the work is executed very much more cheaply if you first construct a groin on the ebb side of the stream, supposing the river is running from the west to the east, a deposit takes place, and your half-tide wall is constructed at a comparatively small cost. The groins, as was described by Sir William Cubitt, in his evidence, are in fact merely the scaffolding to form the new line of shore, not that I am attached to groins per se, but simply that I find in practice the effect to be produced at a very much smaller cost, and that is very well illustrated by the cost of the works themselves in this river, they have cost a very small amount of money; the jetties in cost have not been greater than I have stated in my estimate, and I believe altogether the annual expenditure has not been more than from 5,000*l.* to 6,000*l.*, or even 5,000*l.*, purely upon what I call river works. Other great expenses have been necessary to keep open the establishments at Hay Hole, and on the Jarrow side, which were affected by the attempt to carry out Mr. Rennie's plan. My opinion, as an engineer, is certainly that if you make any works for the navigation, supposing they be only half-tide works, as they turn that space from the half-tide wall to the shore into a quieter state, it becomes a place of deposit, accretion must constantly go on, and after the material gets to the level of half-tide, the current must run less strongly than previously, and of course with every accretion the current gets weaker and weaker, till at last the grass would grow between. I know in works on the Ribble, where I had the honour of reporting for the Admiralty, the grass stands even above the level of the walls. A reference has been made to the state of Shields Harbour. It has been found by an examination of the late Mr. Comrie's very carefully prepared plan, that Shields Harbour is generally considerably deeper than in Mr. Rennie's time; you will find that the pool at North Shields, which is the most valuable part of the harbour, has in some parts as much as 40 feet at high-water spring tides. The channel also is very much increased in breadth at that spot opposite North Shields, or between North Shields and the Insand, and also through South Shields, the sand is pushed considerably more to the south. I am not taking credit for that as the result of any engineering works, it simply arises from the arrangements in mooring the ships; they have been moored well into the stream in both cases, and the natural effect has been to widen the channel. I had the honour of laying before the Commissioners yesterday a plan which was used of late years at every meeting of the Commissioners. It was also used there on river views. There was a large table, and it was frequently unrolled, when I had to make my observations upon it; that is the plan (*pointing to the same*). It is very true, that occasionally when reference was made to it in the committee room, gentlemen did not trouble themselves to unfold it to its full extent, when they only wanted to look at a particular part. That is the explanation with regard to the observation made by one of the members of the Tyne

W. A. Brooks, Esq.
27th January 1855.

Commission, Mr. Stevenson; but it was always there, and frequently in Mr. Stevenson's own possession; he might have opened it whenever he pleased; it is ridiculous to think that I should for a moment have prevented one of my masters from looking to a plan which belonged to them. I now place before the Commissioners a plan which was prepared by me, copied from Mr. Comrie's survey of 1849, showing contour lines in the middle ground, as existing at that time. At the present moment the middle ground is in a very much better state; it is still a shifting sand, which certainly is not the place for any person to make any observations upon, for the purpose of testing the existing state of the discharge of the water in any other part, because by the condition of the mooring of these ships on the north side, you can drive that middle ground more to the south; it is a perfectly shifting sand, and it would be a waste of time, I consider, to base any observation upon it. The Narrows, which have been also referred to, is a more fit place to test, because there you have comparatively solid banks on each side; the banks may vary, the south bank does occasionally vary; the north bank is now pretty permanent, but it consists of hard material. A great deal of stone has been washed out of the banks on the north side and carried upon that point, and though the low-water line does not extend further to the south, yet it is shoaler as regards the breadth at high water, the bank is higher. Now I attribute that circumstance also greatly to the fact, that the Ordnance Department many years ago constructed a series of groins from opposite Clifford's Fort, for the purpose of protecting the wall from the action of the waves, and it had certainly a very good effect. Those groins would necessarily, while they protected the wall, have the effect also of causing an accumulation of material about them; that was in fact their object, and it well succeeded. I have no complaint to make about it. In the presence of such an able nautical surveyor, perhaps it is presumption in me to give any opinion. Gentlemen who had the opportunity of studying the currents in the vicinity would arrive at the causes very rapidly. I have to point out that one great cause of the Narrows being so limited in width, arises from the set of the currents of the flood tide; the current of the flood tide a considerable portion of its time sets over the Herd Sand, and throws the southern region of the Narrows into an eddy state, and another portion of the current, which comes in on the north side in a similar way, throws the northern division into an eddy state. I believe I have sufficiently explained to the Commissioners that the real width of the passage of the current is not so great as appears upon this plan. This (*referring to a chart*) illustrates the nature of the set of the current of the flood tide, that is, the set of the blue arrows, not the red ones; that is in reference to some works which were planned but not executed. Now if works were executed in the form of piers at the mouth of the harbour, as those piers would prevent the range of the flood tide both over the Herd Sand and also from setting so deep into that bight, the natural effect would be, in my humble opinion, an enlargement of the Narrows, because it would come direct in, more true, and it would widen the Narrows, and in that respect very much compensate for what might be considered an obstruction created by piers, because the great obstruction is not now at the bar, but at the Narrows. I believe that if the piers were kept a proper distance apart, I should say not less than 1,200 feet (possibly 1,400 or 1,500 feet would be found sufficient), there would be a very much easier course for the passage of the current of the flood than exists at present. The width between the high-water line is now less than 700 feet, and I will here take the opportunity of stating, that the sand on the south side is also very much more in altitude, For instance, upon the first inquiry into the Conservancy Bill, which was brought forward by the gentlemen from Shields, there was a complaint brought against the old Conservators, that the breadth of the channel had diminished at the Narrows; they brought witnesses to show that formerly there was very much deeper water where the beacon is shown upon this plan, marked by this round dot. At the time of that inquiry it was a fact that the sand was very high. The next year there was also an inquiry before Parliament, when the Corporation of Newcastle-upon-Tyne brought in their Bill; then we heard no more of this complaint. But it so happened that the action of the winds, as directed by Providence, had washed away the sand, and the base of the beacon was dry, the stones which were placed around it to keep it in its place originally were quite bare; there was no complaint, no witnesses were brought to show the state of that navigation.

2004. (*Captain Fitzroy.*) As you look at this chart you may compare this large space to the section of a funnel?—Exactly so.

2005. At present the wide part of the funnel is outwards; with reference to the flow of tidal water, the narrow part of the funnel is inwards. If you were to put two piers, running from any part of the shore towards each other, so as to put a narrow place on the outward, would it not rather have the effect of reversing the funnel, turning the point of the funnel outwards, and putting the wide part inwards?—I certainly think it would.

2006. It is a question to be considered?—Yes; and therefore I say the greatest care should be taken in the gradual execution of the works, so as not to contract it too much. The existing state of things cannot well be worse, if you look to the extraordinary narrow state of the passage opposite Clifford's Fort.

2007. Yet it is very remarkable, that in Mr. Rennie's survey of 1813 the width and depth vary very little from the present time, and the depth and rise on the bar appear to be identical within an inch or two?—There is not much difference; the variation in the Narrows has simply been just at this beacon, not varying much the high-water section.

A. Brooks, Esq.

27th January 1855.

2008. The depth has increased, has it not?—I believe it is the same; I have surveys which I should like to put in before the honourable Commissioners; they will be verified by another witness. They are transverse sections made by Mr. Rendel, or in Mr. Rendel's office, of the river, commencing at this beacon in the Narrows, and going westward. Those transverse sections show first of all the state of the navigation in 1813, then in 1849, and the last are soundings taken by Mr. Comrie last year. I took those out of the hands of the surveyor this morning; he was engaged in laying down all the soundings; he has only got up so far as near Jarrow. No. 1 is the sounding in the narrow part of the Narrows, opposite the beacon, and the others go westward. If the honourable Commissioner will please to examine it, he can draw his own deductions from it.

2009. There are no depths given?—The depths are laid down to a scale.

2010. But I see no means of verifying that scale?—It can, of course, only be verified from the soundings on either chart.

2011. Can you state the results?—I shall be able to state the results. The No. 1 section, if these have been correctly taken (I will produce a party who will give evidence that he put them correctly on) shows a large section. No. 2 and No. 3 the same.

2012. It is remarkable that Mr. Rennie's rise of tide on the bar in 1813, the average ordinary spring tide rise, is 14 feet 11, and according to the pilots last year it is 14 feet 8, being only a difference of 3 inches?—Yes; but I should observe upon that, that the pilots take their rise of tide from a place, which was described by one of the witnesses, called the Coble Landing, that is, a little to the west of the narrows above the Narrows. Now there is a considerable fall between Shields Harbour and the bar, so that when the pilots take the depth of water on the bar, and add to it the rise of tide at the Coble Landing, or in Shields Harbour, they do not then give the true depth between the bottom of the bar and high water at sea.

2013. It must be very much against their own interest if they do not, because they must be ignorant as to what vessel can come over the bar. No doubt it is apparently a rough method, but when examined you will find it gives a correct result?—It is a safe one; it about gives the lead in; there is frequently a foot difference.

2014. (*Mr. Armstrong.*) It is on the safe side?—It is.

2015. (*Captain Fitzroy.*) The results given by Mr. Pearson, the ruler of the pilots, agree exactly with Mr. Calver's latest surveys?—They will do that; there is no difference between Mr. Calver's latest surveys and Mr. Comrie's, as to the water on the bar; it is about 22 feet 3. I do not impugn Mr. Calver's figures in that respect at all. Mr. Calver makes his observations from a gauge kept at the Prior's Stone; of course there there is not so much fall, but still a fall does exist.

2016. (*Chairman.*) Now, I think you have given us a history of the river since it has been under your direction, from the beginning to the end. Is there anything more which you wish to say with reference to all these plans?—The Commissioners are about to execute piers at the mouth of the harbour. There is some little delay, which has arisen with regard to the detail of the plans, that rests with the Admiralty; when their sanction is given the works will proceed rapidly; it is no fault of the Commissioners, certainly, that they have not been proceeded with more vigorously; there has been a great deal of care taken that they should be properly constructed, and that the proper plan should be adopted. The final decision as to the direction of the piers was left to Mr. Walker, to whom were submitted a number of plans, some by eminent men. Captain Washington gave one plan, Captain Vetch another, Mr. Calver another, and Mr. Thomas John Taylor one, and several plans were given by myself; the first one by me was as far back as 1832; that started from under the Spanish Battery, took a southerly direction, and subsequently an easterly direction, about the course which I have described upon the present plan; what is called Mr. Walker's plan is substantially my own plan, because one plan which I laid before Mr. Walker is described by the blue lines on this plan at the mouth of the harbour. It will be seen that Mr. Walker's north pier approximated very closely; it starts from the same point as my own; mine has a little more curve, and that is all. The south pier also starts from nearly the same point.

2017. You say the Admiralty sanction has just been obtained?—It has been obtained to the direction of the piers.

2018. On which plan?—On Mr. Walker's line of direction, or rather, the same as my own; in fact, I was the original projector of those piers.

2019. (*Captain Fitzroy.*) Is not the substantial reason why the Admiralty have not hitherto given their full consent, their not having yet been furnished with bonâ fide estimates or approximate estimates of what the works will cost, the difficulty of giving those estimates being caused by the sand not having been yet bored through to a solid foundation; therefore, no engineer can say what the expense will be of carrying out these piers?—The Herd Sand, on which the south pier is to be constructed, has been bored to a considerable depth. It was bored by Mr. Rendel 30 feet, and was found to consist of nothing but sand, and, therefore, unfit for the construction of any other work than a mere rubble breakwater; and the Admiralty, very wisely, in my opinion, have compelled the Commissioners only to make a work of that construction, satisfied that Captain Vetch, or whoever the gentleman may be who advised the Admiralty, or Captain Washington, saw the importance there of saving a very large expense. Mr. Walker in his section shows masonry, rubble, at the bottom, and then vertical walls; but the Admiralty forced the formation simply of what

we should call a back-bone or nucleus for the sand, which would have the same effect as an expensive work of masonry. At the present moment, a little difficulty has arisen from the fact of my having sent in a working drawing showing long slopes to the pier. The Admiralty require that the drawing should show merely the natural slope which rubble would take when teamed over. Now an engineer, knowing that he has to show to the public a work which is meant to stand the action of the wave, must be exceedingly unwilling to lay before any persons a plan which he feels must be knocked down by the first gale of wind; if it shows a steeper slope it must be knocknd down by the first gale of wind that strikes it. I quite agree with the wisdom of the Admiralty in urging that we should endeavour to make it as steep as possible, and the specification which has been drawn up compels the contractor to carry out those views of the Admiralty, that is, to push the work as rapidly as possible over the sand, and to use the least possible quantity of stone.

2020. Is not the cause of the delay the want of specific estimates?—There has not been an estimate given certainly, either by Mr. Walker or by myself, as to the cost, beyond the Parliamentary estimate; but it has been submitted that tenders have been received for commencing this work on the south side at a price which has been below that named in any Parliamentary estimate.

2021. Is not the amount which can be raised at present for the prosecution of that work limited to 200,000*l.*?—It is, or thereabouts, 230,000*l.* or 240,000*l.*; and therefore the Admiralty have endeavoured to take care that the money shall not be thrown away.

(*Mr. Cowen.*) That is a mistake; we can borrow 200,000*l.*, but we have a right to go on permanently.

(*Mr. Brooks.*) As the entire capital would not be required in the first instance, of course you would have the advantage of the accumulation of income during the construction of the works, which would amount to a considerable sum. I believe the income is about 12,000*l.* from the pier dues. The opinions of Captain Vetch, Captain Washington, and my friend Mr. Calver, were certainly in favour of my original pier, that is, the north pier.

2022. (*Captain Fitzroy.*) But in a case of that kind, of course the gentlemen interested in the Tyne would endeavour to obtain the highest opinions in the country, of first-rate engineers?—Certainly; but nautical men upon these points are very often able to give a better opinion than engineers; unless the engineer really has some nautical information, he is quite an unfit man to be trusted with laying out any line of pier, unless he has had some experience in it. I may say, that I was induced to change my direction of the north pier to a point commencing further north, with the view of rendering it more safe for ships to go in; not that I considered that a greater depth of water would be maintained than at the other place, as shown upon the plan, but I considered that inasmuch as you often have 100 ships running into the harbour in a single tide, less danger of accident would ensue, from the only danger being between the two pier heads, once having passed which, a ship would not have the chance, by any awkward management, of falling upon the pier. Mr. Rennie's south pier took quite an east and west direction, as is shown upon the large plan. He had no north pier to cover it, so that any vessel running into the harbour during a north-east gale of wind, while endeavouring to avoid the shoal water called the Spar Hawk, would run the risk of being carried to leeward and wrecked upon the south pier.

2023. (*Chairman.*) The one which you show now is the improved line?—It is; that I believe is generally sanctioned.

2024. Do you wish to say anything more?—I have merely to observe that the Commissioners are making very extensive docks above Hay Hole Point; vessels very often now during a gale from the north-east, drive upon the Herd Sand, and then beat up over it. If it happens fortunately during the flood tide, they then beat up to the shore, and their lives are generally saved. I have said that the general effect of the works must be the reduction of the low-water surface. That is one great object, of course, of this contraction of the navigation; driving away the shoals which dam up the water, as at Hebburn, you necessarily depress the low-water surface, there is a better drainage. The Tyne Improvement Commissioners will bring witnesses to show that the water now generally falls out 9 to 12 inches lower at Newcastle than formerly. The low-water gauges were originally established at different parts of the river previous to Mr. Rennie's datum level, and the spring tides now ebb out below the zero; you frequently see the tide at Bill Point and at the the jetty 9 inches to a foot below the bottom of the gauge.

Cross-examined by Mr. Webster.

2025. Mr. Comrie said that you had to do with the reduction of the soundings?—I had nothing to do with the reduction of the soundings. I did not interfere in the slightest way with Mr. Comrie.

(*Mr. Comrie.*) I merely said that Mr. Brooks had to do with the tidal observations. I had nothing to do with soundings.

2026. (*Mr. Webster, to Mr. Brooks.*) You have referred to your report of January 1843?—Yes.

2027. Will you give me the plan accompanying that report?—The secretary has it. (*The same was produced.*)

2028. Was this the plan that accompanied your report in 1842?—This plan was.

2029. Is it now in the same state that it was then?—No, it is very much dirtier.

2030. As regards river lines, is it in the same state as it was?—It is in the same state,

W. A. Brooks, Esq.

27th January 1855.

with the exception that in the neighbourhood of Jarrow a fresh blue line has been drawn, making the river a little wider in that part.

2031. Are the river lines all the same?—The river lines are the same. I do not see any difference.

2032. Is this the plan which was produced before Captain Washington, on the Inquiry in 1848, as the plan of 1842?—It is.

2033. Am I to understand you to say, that this is the plan according to which you have carried out the works which you have done under the late Conservancy as well as the present?—They are generally carried out upon that plan; trifling deviations have been made which are shown upon the large plan. I may say, substantially they are the same.

2034. And in the works which you have executed, you have intended to execute them as river lines up to those lines, have you?—Yes.

2035. At Bill Point, for instance, just tell whether the works there have been executed up to those lines?—They have, where the jetties are laid down.

2036. I think that the jetties at Bill Point are considerably beyond that line in one place, and considerably short in another?—They are not, according to my belief.

2037. Just look at this (*producing another plan*); you have seen that before, have not you?—Yes; but I do not admit its accuracy.

2038. Is this the plan which was produced in Parliament in 1849–50?—I am not prepared to answer that question; possibly it is.

2039. You were cross-examined upon this point, I think, at that time, were you not?—I believe I was. I was cross-examined for a very long time; for some hours together.

2040. I will ask you whether, as regards those three jetties at Bill Point, two of them, as they are now and as they were then, are not considerably within your line, and whether the one nearest Bill Point is not considerably beyond it?—They come very near to the line; the westernmost jetty is not out to its full extent; the depth of water has been produced before going to the full extent.

2041. How many jetties are there now?—Three.

2042. Is the easterly one considerably projected beyond the two westerly ones?—It is a longer jetty.

2043. For instance, with reference to Mr. Rennie's line, your line at Bill Point is considerably beyond Rennie's line?—Considerably. I made a deviation from Mr. Rennie's plan upon that, believing that by advancing the jetties further from the bight above Bill Point into the stream, I should be able to get a better and easier navigation than by adhering to Mr. Rennie's lines. If Mr. Rennie's lines had been executed as they are laid down, I feel quite satisfied that they would not have so effectually removed the Bill Sand; there would not have been so energetic an action upon it.

2044. As a matter of fact, your line there is considerably beyond Mr. Rennie's?—It is; and the sand has gone away, and a navigation has been produced.

2045. The westerly jetties are carried beyond Mr. Rennie's line, but not up to yours?—They are carried beyond Mr. Rennie's line, certainly.

2046. But they are not carried up to yours?—Precisely so, as to a short distance, 20 or 30 feet.

2047. At Losh Wilson and Bell's, Mr. Rennie's line was within your line, was it not?—It was.

2048. And Losh Wilson and Bell's Quay is upon Mr. Rennie's line, is it not?—Originally it was; a portion of their quay is built upon Mr. Rennie's line.

2049. Did not your line, as laid down in the plan of 1842, project considerably beyond Mr. Rennie's line, and considerably beyond the quay of Losh Wilson and Bell?—No; my line is from the existing quay.

2050. That is not an answer. I will repeat the question. I ask you whether your line opposite Losh Wilson and Bell's is not considerably beyond Mr. Rennie's line?—Along that reach generally it is beyond Mr. Rennie's line.

2051. Therefore, I may take it, that along the Reach from Bill Point down opposite Losh Wilson and Bell's, in the Bill Reach, at Walker Quay, and down to the Wallsend staiths, and, in fact, all along the front of the Corporation property at Willington, your line is considerably beyond Mr. Rennie's line?—No, it is not considerably beyond. I have explained now the difference which exists between them. First, with regard to Bill Reach, my line goes beyond Mr. Rennie's line, because Mr. Rennie, in carrying out his works, has not followed what I consider to be the system of carrying out a line as laid down in Du Buat's work; he has not made the north shore or the north quay line a tangent to the curve below it, which it ought to be.

2052. Which is the curve?—The curve below it is down Wallsend Bight. If you wish to secure a proper direction to the current after leaving the concave shore, it is indispensably necessary, in an engineering point of view, that the straight reach should be a tangent to the curve. I say that principle was departed from in Mr. Rennie's line, and it would not have produced so useful or so fixed a channel.

2053. Then, as a matter of fact, on the north shore, from Bill Point down to Coxlodge and Heaton staiths, or down to Walker New Quay, at all events, which we will take in the first instance, your line is beyond Mr. Rennie's?—Down to nearly the west end of Walker New Quay it is beyond Mr. Rennie's.

2054. Then from Bill Point to the west end of Walker New Quay your line is beyond Mr. Rennie's line, is it not?—It is generally; but allow me to state that if Mr. Rennie's line had been made as laid down there, I am quite satisfied that there would not have been so good a depth of water for the navigation.

2055. You have told me that on the north side of the Tyne, between Bill Point and the west end of Walker New Quay, your line is beyond Mr. Rennie's. On the south side of the Tyne, is not your line also considerably beyond Mr. Rennie's?—It is.

2056. Will you tell me to what extent you have proposed to narrow the channel there beyond Mr. Rennie's line?—It varies in every part of the reach.

2057. Does it not amount to a very considerable narrowing, as compared with what Mr. Rennie proposed?—Yes, it does.

2058. To how many feet?—I say it varies in every part of the reach.

2059. That is not a very great distance; it is about 100 feet less, is it not? Your lines would narrow the channel there more than 100 feet probably?—Yes, more than that; 264 feet where the bight exists.

2060. Be so good as to tell me what would be the width at the Bill Point; what is the narrowest point of that channel?—The narrowest channel would be about the Bill Point.

2061. What was your proposed width at Bill Point?—Upon this plan it is nearly 7 chains, say 520 feet.

2062. 244 was what you proposed to narrow it beyond Mr. Rennie's?—No; at this part there is a difference of about a chain and a half, about 100 feet.

2063. Then the channel at the narrowest point is about 520 feet, according to your proposed river lines, at the Bill Point; and what is the channel at the west end of Walker Quay, according to your proposed lines? I need not trouble you for the dimensions. The narrowing of the channel there is very considerable as compared with Mr. Rennie's?—Yes, it is less than Mr. Rennie's; not much wider than it was formerly.

2064. Supposing your lines had been carried out, the Walker Quay would not have been upon them?—No.

2065. The Walker Quay, you say, is constructed upon Mr. Rennie's line?—A great portion of the Walker Quay is constructed upon Mr. Rennie's line, and was constructed upon that line before I entered on my duties as engineer.

2066. Notwithstanding that, have you laid down a line which would come beyond that?—Not Walker Quay; Walker Quay exists; there is no change made in it.

2067. I beg your pardon. I mean the Walker Iron Works; Losh Wilson and Bell's?—Yes, a part of their works are carried out to that line now; the New Quay is carried out; it is all done with their consent.

2068. What is the area which has been added to their works by that?—I can not give that at the moment; I can furnish it if required.

2069. It is a very respectable piece of land, is it not?—There is, of course, a certain quantity of land gained by it; it cost a good deal of money to make it.

2070. It was made out of the river fund, I suppose?—No, it was not; it was made by the Walker Iron Works.

2071. Entirely?—Entirely.

2072. Was it made with dredged materials from the river? were the dredged materials put in there?—No, it was done with slag from their own works. We have got a great deal of slag from their works for nothing, for the purpose of making our river walls. We sent a craft alongside, and loaded the material, and saved a great deal of expense to the Commissioners. At one time they wanted 6*d.* a ton, and I refused to give it.

2073. Slag is like ballast, is it not?—It is very useful for river walls.

2074. The portion of land on the south side in that neighbourhood, between Bill Point and Walker Quay, which would be reclaimed from the tidal area, supposing your wall should be carried out, is very considerable?—It is not, with all submission to you; and there is none reclaimed there at all.

2075. I say, supposing your river line should be carried out there, it would be very considerable?—No, it would not be very considerable.

2076. Will you be so good as to tell me what is the distance. I will take about the middle of the distance, opposite the Walker Staiths?—That is quite a different part; you said opposite the Walker Iron Works, near Bill Point.

2077. I thought I said Walker Quay?—Do you mean the deepest part of the bight?

2078. Have you not the miles put?—No.

2079. Do you see the Walker Staiths?—Yes, I know their position.

2080. Do you see them on the plan?—Yes, I see the Walker Staiths upon the plan.

2081. Be so good as to tell me what is the distance from your lines to the high-water line at that point?—About 200 feet; the area of that piece of land is considerable.

2082. All of it being considerably beyond Mr. Rennie's line?—Yes, it is beyond Mr. Rennie's line.

2083. At the Coxlodge and the Heaton Staiths, have the works been carried out either to Mr. Rennie's line or to your line?—They have been carried out to Mr. Rennie's line.

2084. At Coxlodge?—At Coxlodge.

2085. Are you quite sure of that?—They were carried out at Coxlodge before I came on to my duties, in point of fact, and upon Mr. Rennie's line.

2086. Are they carried out to your line?—I had no option; the work was constructed, and I was forced to adopt it.

W. A. Brooks, Esq.
27th January 1855.

2087. Does your line coincide with Mr. Rennie's there?—It necessarily does. I could have had no new one; but if I had had my own way, and no work had been constructed, I should have certainly preferred carrying out the work further to the south, and not have constructed any works on the Hebburn Quay side. I think that is an error of construction; there should be no works on the south shore. It would have been far better, and the curve would have been easier, if you had carried it out further into the river.

2088. I will go to Killingworth. To what extent are the Killingworth Staiths beyond your line, and also beyond Mr. Rennie's?—There my line goes beyond the Killingworth Staith about 60 feet.

2089. Do you mean to say that the Killingworth Staiths are not actually beyond your line by 60 feet?—No; they are beyond Mr. Rennie's line by that distance.

2090. Are they not beyond Mr. Rennie's line by as much as 140 feet?—No; I think not.

2091. Do you remember being examined before Captain Washington and the House of Commons?—Yes.

2092. As a matter of fact, do not the works at Killingworth extend 140 feet beyond Mr. Rennie's line, and 60 feet beyond your line?—No; I do not think they do. It must be a mistake.

2093. Had you anything to do with the erection of those works?—No; they were done by the owners of Killingworth colliery.

2094. When were those works erected?—My last plan gives a date (I forget now the dates) somewhere about 1846 or 1847. I find it was in December 1844 that they were commenced.

2095. That was when you were engineer to the Conservators?—It was.

2096. And are not those works extended 60 feet beyond the lines which you laid down in your report of 1842, and 140 feet beyond Mr. Rennie's?—No; I believe they are not. The alteration from Mr. Rennie's line at that spot and at Willington was made with the view of throwing the deep water more into the Hay Hole Channel. That was a necessary consequence. If the works had been kept as shown by Mr. Rennie's line, they would not have produced that result of turning the channel on to the Hay Hole shore.

2097. I do not ask you for the reason: I only ask you the fact whether the staiths at Wallsend and Killingworth Staiths, the one of which was erected in 1844, and the other in 1846, do not extend, not only beyond Mr. Rennie's line, but also beyond your line?—I believe not.

(*Mr. Brunel.*) They do not seem to be beyond on this plan; nothing material.

2098. (*Mr. Webster.*) You have said in your examination that the owners on the south side, in the neighbourhood of Jarrow, had been expecting to get certain portions of land, but were very much disappointed?—Yes; the promise was not kept with them.

2099. What promise do you mean?—The promise which was held out by the former Conservators.

2100. What was the nature of that promise?—I have stated it already. It was to the effect that if they consented to the construction of works on that shore (that was on the Jarrow Quay), to have the effect of turning the channel into the Hay Hole channel, or to change Mr. Rennie's plan, then the works should be full-tide works, and they would have the benefit of that land which was made.

2101. Has the practice been in this river to construct works from time to time, and afterwards consider the position of the river lines?—I have not heard of it.

2102. If there was this uncertainty about the direction where the works were to go, had you any definite river lines at that time?—I have stated so in my evidence previously; that there was not that uncertainty to which you refer. The question of uncertainty could only apply to where a change had been made; as, for instance, at the Jarrow works, where Messrs. Palmer make their application. The original line on the south side, determined by the points of the jetties in the Jarrow Bight, advanced more to the north, for the purpose of turning the channel down the Hay Hole shore; but when the construction of the dock was determined upon, and the Act of Parliament had been obtained, when the Messrs. Palmer made their application, it became necessary to re-consider that line. The Commissioners saw that a new line must be made to coincide with the change as regards the dock and the point of the lower jetty in the Jarrow Bight. Originally, this jetty, a little above the west end of Hebburn Quay, went out about 30 feet or 35 feet further into the stream. A wall had been constructed between the jetties, which was formed of rubble, and the space within had been filled up with dredged material to as high a level as we could get; then when an application was made by the Messrs. Palmer, this new line was formed to range with the general existing quays and staiths at Jarrow, which would no longer give the parties the land which was originally contemplated to be given to them in consideration of the inconveniences which they would sustain by reason of the deep water being turned from their shore on to the Hay Hole shore. The new line was made concave, so that eventually they would have had a fair depth of water. It would have been turned concave on the upper part, and have gradually become convex at the lower part of the quay.

2103. Willington Quay is nearly opposite Messrs. Palmer's, is it not?—It is.

2104. Was a part of Willington Quay considerably beyond Mr. Rennie's line?—When I came I found the Willington Quay upon Mr. Rennie's line.

2105. But did you find any part beyond it?—No, I did not; but I made it to go beyond

W. A. Brooks, Esq.

27th January 1855.

Mr. Rennie's line, as I have stated before, because I found it necessary, in order to force the current more into the Hay Hole shore. If this had been kept back, the tide could not have been thrown on to the Hay Hole shore in that manner.

2106. Then you projected Willington Quay beyond Mr. Rennie's line at th west end?—Yes, and I executed it.

2107. To what extent is it beyond Mr. Rennie's line?—I think about 100 feet.

2108. And that is beyond your line also, is it not?—No, upon my line.

2109. This is the paragraph, I suppose, in your report? "Higher up the river the next "shipping establishment which will be affected by my plan is that on Willington Quay, "the property of the Corporation, which by either of the above referred to designs, must "be carried farther out, or into the true run of the tide."—Yes; there there has been only a sacrifice of the property of the Corporation; that property belongs to the Corporation, and Willington Staith, as regards depth, is the worst in the river. I did not consult the interests of the Corporation, but the general interests of the river, and they have now shoal water, and there are frequent complaints from them in consequence.

2110. Did not the Hay Hole staiths become silted up?—They would have been nearly dry if this plan projected by me had not been carried into execution.

2111. Was not the consequence of the execution of that Willington Quay, the silting up of the Hay Hole staiths?—No doubt of it.

2112. And probably that was added to, to some extent, by your projection beyond Mr. Rennie's line?—No, the very reverse. It is notorious that my works swept away, I should say, not less than 23 acres of dry sand.

2113. Do you mean to say that your projection of that piece of corporate property at the west end of Willington Quay, improved the condition of the staiths in Hay Hole?—Yes, certainly, in connexion with other works on the south side.

2114. Notwithstanding the projection of the Willington Quay, and those works on the south side, did the Hay Hole staiths continue to get worse?—They have required frequent dredging, because there is no doubt that not so much tide goes down now as formerly, but energetic works would have been necessary to restore the channel to what it formerly was. Old charts show that this was once a shoal place in the Hay Hole; the river has changed very materially; at one time it was shoal this side, and deep water at Jarrow, and the reverse at times; but generally Hay Hole was deep water, and a capital shipping place.

2115. Then, notwithstanding these operations which you carried out of your own will, the Hay Hole Staiths got worse?—No, they got better; there was no outlet at the west end of the channel at all, and now there is 5 feet water through at low-water springs tides, or 4 feet 6 inches certainly.

2116. Then if the Town Clerk has said that in consequence of that quay being upon Mr. Rennie's line of improvement, the Duke of Northumberland's staiths in Hay Hole and the other staiths in Hay Hole became so prejudicially affected as to render the docks necessary; that is not the fact in your opinion?—No; I do not say that at all; I say the staiths got better from their original condition before we commenced those works; but previously to the Willington works being constructed it was much deeper. The Town Clerk's observation is perfectly correct.

2117. But if in 1852 the Town Clerk said that in consequence of those works, "the "Commissioners have hanging over them claims which may or may not succeed in respect "of damages which will accrue by continuing to carry out the improvements upon "Mr. Rennie's line of improvement on that bank of the river;" that is not true?—No; it is true because they had formerly deeper water there, and no doubt they have been damaged by attempting to carry out Mr. Rennie's plan.

2118. Then notwithstanding the projection of this quay and the works on the south side, the Hay Hole staiths got worse?—Because they were not restored to the former state of deeper water.

2119. Who made these promises to Messrs. Palmer and Company, and Mr. Ellison, and so on, about the land they were to get?—They were given through the River Committee of the Corporation.

2120. Is there any record of them, do you suppose?—I do not remember. I remember handing to Mr. Brown a plan showing the new line of frontage.

2121. Was the practice as regards these promises of land that there were communications between you and the parties upon a plan; for instance, upon a plan like that which you have now produced?—I do not know of any other case excepting that with regard to Mr. Brown, at Jarrow.

2122. Then, as regards Mr. Brown and Mr. Ellison, had you given them a sort of understanding that they were to have this land carried out to your line of river wall?—It has been always stated by me that my lines were intended to be full-tide lines, and if they had not been full-tide lines I am quite satisfied they would not have been executed.

2123. Have you said anything of that sort in this report of 1842 to which you have referred? Let me call your attention to this passage:—"All that is truly requisite for the "improvement of the navigation here," that is, at Willington and Hay Hill Point, "is "fully to carry out his principle," that is, Mr. Rennie's principle, "of leading the currents "of ebb and flood into a single channel." I ask you whether there is in this report of yours a single word about full-tide walls or full-tide groins?—The works being carried on at the time in the river were all full-tide works, and it was always stated that they were to

W. A. Brooks Esq.
27th January 1855.

be full-tide works. The jetties are all made to the level of high-water spring tides, and rather above.

2124. Do you mean to say that you represented, in this report, that all your works were to be full-tide works?—That was always understood.

2125. Is it stated in this report?—It may not appear in the wording, but it is not stated to the contrary. There is no allusion to hal-ftide works, because I feel quite satisfied that half-tide works would eventually produce full-tide works, or land; it is merely a question of time, an accretion will go on.

2126. Do you mean to say that half-tide works, without full-tide jetties, would grow up into land to the level of high tide?—No doubt of it.

2127. Will you mention a single instance, in the Tyne, in which anything of that kind has taken place?—We have not had time to do it. In a river like the Tyne a very rapid change takes place in the height, until the sands get about the level of half tide, or a foot or two above it. Afterwards, as I have stated before, the process becomes very slow, because then the heavy materials removed by the current are carried down by the stream, and it is only the light particles that rise and go in between the jetties and form land; it must be slower.

2128. Has not Jarrow Slake continued at about half-tide level from time out of mind?—A great portion of it has only from 4 to 5 feet water upon it at high water of the spring tides, and therefore is not what you call half tide; but I can give a reason why Jarrow Slake is not converted into land. It arises from this fact: the course of the flood current sets heavily into Jarrow Slake, and tears up from it the deposit which has been made by the previous eddy produced by the ebb current. On the ebb, Jarrow Slake is in a silting or eddied state; while on the flood tide there is a heavy range of current over it, in lieu of the direction of the flood tide being true or up the river: therefore, when the Jarrow dock works are made, the current, instead of wasting its energy on the top of Jarrow Slake in tearing up this mud, will be directed better into the main channel of the Tyne. Any person acquainted with this part of the navigation during that time when the tide is running strong over Jarrow Slake—any person who examines the water on the south side of the river abreast of Jarrow Quay when the tide is setting forcibly into Jarrow Slake—will be struck with the difference which is presented to his eye between the water which passes between the section from the quay to whereabout this black spot is on the plan, and the kind of water which passes on the north side. That on the south is like the mud and sand which you will see just at the discharge of the water at the mouth of the river,—there is a strong line of demarcation between the river water and what you may call the pure sea.

2129. Can you give me any instance in the Tyne which you can adduce in support of your opinion, that in a half-tide wall the land would grow behind it above the half-tide level?—As half-tide works have not been made in the circumstances you speak of, I cannot adduce it.

2130. Do you, as an engineer of considerable acquaintance with the Tyne, assert that the opinion expressed by Mr. Straker and other persons conversant with the river, that the surface, though it has grown up to the half-tide jetty, will be kept clear above by the wash of the tide and other causes, is not true?—I do not like to use the words "not true," but I am satisfied, being a professional man, that their opinions are erroneous.

2131. Although behind the half-tide walls there is nothing higher than half-tide jetties?—Certainly; I am of that opinion, very strongly; I know instances where in a river you will find the grass growing above the level of the walls, and the land between the jetties is above the level of the river walls.

2132. But your jetties are full-tide jetties?—Therefore I say it is not at all a parallel and fair case, but if you once fix a channel you produce still water between the wall on each side and the shore, and that deposit must go on.

2133. This report of yours, of 1842, professes to carry out Mr. Rennie's report, excepting as regards the particular variations of lines which you recommend?—It professes to carry out the general principle.

2134. Was not Mr. Rennie's general principle half-tide walls, excepting at Newcastle and down at Shields?—Certainly not; half-tide walls are not mentioned in his report, excepting in the neighbourhood of Jarrow Slake, and I will show that you are wrong, by a reference to his own plan, and the position of the groins as shown on Mr. Rennie's plan, which were to go above the level of half tide because, where I now put the stick, which is close by high water, the soundings show very shoal water, only 36 or 37 inches, and the jetties evidently run to that point; so that if they were only to the level of half tide, they must be terminated at some point in that part of the river, at least 6 feet 6 below high water. They are jetties, at all events, commencing at high water upon the shore, and pointing down to half tide, or a little above half tide, at their ends. I understand the works to be sloping down towards the channel.

2135. Do you call Mr. Rennie's full-tide jetties?—No; I have never said full-tide jetties.

2136. But you have executed full-tide jetties in the Tyne?—Certainly: and in the Tees, and I knew that these works would eventually produce the same effect, and convert it into land, only in a longer period.

2137. Your object was land-making?—To improve the navigation.

2138. And in improving the navigation to make land, according to the understanding

with Mr. Brown and these other people?—Not at all; I never thought of the question of making land; that wholly arises from the nature of the works; you cannot improve the navigation, where it is so bad, without making land.

2139. Just let me read this passage in Mr. Rennie's report: "As it will receive the "tide-water in the first quarter of flood, and will retain this water until the last quarter "of ebb, it will produce a much greater effect in scouring the bar in proportion to its "quantity than it now does; and in addition to all these, it is proposed that the height of "the jetties shall little exceed the height of half flood, so that a principal part of the space "embanked will still remain as a receptacle for tide water." I will ask you whether, in the face of that passage in Mr. Rennie's report, which says, that "the jetties will little "exceed the height of half-flood, so that a principal part of the space embanked will still "remain as a receptacle for tide water," you mean to assert that Mr. Rennie ever contemplated full-tide jetties?—It is contradicted by his own plans.

2140. Will you show how it is contradicted by his own plans?—I have stated it plainly.

2141. The plan which you have produced of Mr. Rennie is not the original plan, I think?—The original plan is the same. I find it upon the original plan exactly what I have stated; it goes over the shoal water and then it comes to the shore.

2142. It goes away to nothing, I suppose?—It goes away to nothing.

2143. Will you be so good as to produce the plan? Mr. Rennie, in his report, says, "By "the line of jetties laid down by me, the surface of the channel, supposing the tide to be "confined within these points, will be reduced to about 896 acres, namely, 448 acres less "than it now is at high water." I suppose the surface of the channel, which is to be reduced to 896 acres, is the sailing channel?—Yes; but there is no sailing channel to that extent.

2144. Therefore the 896 acres that Mr. Rennie refers to, are the area between his walls?—No doubt of it.

2145. What will be the area between your walls, supposing your lines of river walls should be carried out?—I cannot give that until Monday; but I should state upon that point, that in one part of my plan there are river lines drawn; but I had no intention of making any walls at all there, that is, between the east end of Hebburn Quay and Black Staith.

2146. Is not that this classic ground, about which there has been so much contest?—No, it is not that classic ground.

2147. Does not that first red plot show Messrs. Palmer's encroachment, and that last red plot show Messrs. Leslie's?—Messrs. Palmer's encroachment is a long way below.

2148. Is not that first red plot, where your finger is, Messrs. Leslie's encroachment?—It is, but it is a very small spot.

2149. It is like the baby—it is a very little thing to begin with; but what will the baby grow to, supposing that spot is carried out to your lines? What is the area?—About 44 acres between Black Staith and the east end of Hebburn Quay. I am alluding to the stone jetty above Black Staith on the east side, and the east end of Hebburn Quay at the west side. Now, as there was very deep water in the channel to the northward existing, I did not press upon the Commissioners that this work should be made. It arose from the Commissioners themselves, who wished to try the experiment of what a half-tide wall would do. I should have been quite content to have it an open space.

2150. You thought that that piece of land might be left open?—Yes; the navigation may be improved.

2151. Who was it on the Commission that thought otherwise?—I think the Shields gentlemen were the parties who took a leading part, and Captain Purdo, who urged this trial being made with the half-tide wall; it was their work, most decidedly, so that if there is any blame in that abstraction, it must certainly fall upon those gentlemen.

2152. Who was it in the Commission that originated the application for these grants of land to Messrs. Palmer?—That is quite another question; you are going now lower down the river.

2153. To Messrs. Leslie, then, if you like?—Mr. Leslie made the application. I know nothing of it. I am reminded that the resolution was from Mr. Poppelwell.

2154. What resolution?—Recommending this half-tide wall to be constructed, which would virtually have the effect of converting this large space into land.

2155. Will you be so good as to produce the plans which were supplied to Messrs. Palmer and to Mr. Ellison, when these grants were agreed to?—I will produce them on Monday. I dare say they can be found in the office; if not, I will get a copy from Mr. Palmer. I can describe what the plans were. I should say the same as is shown upon this large plan above.

2156. Have you or have you not the plan, showing the extent of land that Messrs. Palmer were to have?—Yes, there is a plan deposited in the Commissioners' office.

2157. When was it made?—I forget the date; but it was made by Messrs. Palmer, and submitted by them to the Commissioners.

(*Mr. Cowen.*) And signed by the Chairman, I have no doubt?

(*Mr. Brooks.*) And upon that plan the altered line was drawn.

2158. (*Mr. Webster.*) What do you mean by the altered line?—The line setting back the wall a little more to the south, that is, to bring it in unison with the altered circumstances arising from the intention of constructing the Hay Hole dock.

W. A. Brooks, Esq.

27th January 1855.

2159. Do you mean to say that there was any plan signed by the Chairman, or ever brought before the Commissioners, upon which that grant was made?—I believe so; I believe I shall produce it on Monday.

2160. Were you aware of the insertion of that advertisement in September, advertising that land as land with valuable water frontage for manufacturing purposes?—I have never seen it; probably it may be part of it valuable for water frontage, and part of it is not; part of it will be eventually valuable for water frontage; that is the part in the Bill Reach, but the part opposite the Cockcrow Sand will not be valuable for water frontage.

2161. If that is made into solid land with a full-tide wall, will not it be very valuable for manufacturing purposes?—For manufacturing purposes, but if they want water, because with a convex shore they can never have deep water——

2162. But I thought you mentioned an instance where, with a convex shore in the Tyne, it was deep water?—Yes, that is a remarkable circumstance.

2163. Do you know who Mr. Forster is?—Mr. Ellison's agent. For instance, there was deep water on Mr. Ellison's quay, at Hebburn, but from the altered state of the river arising from these works, Mr. Ellison will lose all the deep-water frontage which he had along that quay. It is becoming shoal because the deep-water channel there is to the north; the sand is rapidly rising opposite his quay, and will be a shoal presently.

2164. Have you been in the habit of attending these River Lines Committees that have met?—Yes.

2165. How many committees have there been on the river lines?—I do not recollect more than two or three.

2166. How early was a River Line Committee appointed?—I cannot tell without referring to the books.

2167. Have you attended frequently?—I tell you only two or three; two or three cannot be frequently; I mean two or three meetings of the committee, I always attend.

2168. Have there not been two distinct River Lines Committees, the one called Mr. Robinson's River Lines Committee, and the other Mr. Cowen's, I think?—I do not know, I think that is a mistake.

2169. Has this, which you call your plan of river lines, ever been adopted by the Commissioners?—It has never been formally adopted by any resolution, but it has always been acted upon; certain works were going on, and no resolution passed to stop them; the majority of the Commissioners saw the beneficial effects arising from the works to the navigation, and they allowed the works to go on.

2170. Then, in point of fact, the works have gone on according to the river lines which you laid down in your report of 1842?—Yes, and the river improved thereby.

2171. That is a matter of opinion; and land made thereby, I suppose?—Not yet; in some parts.

2172. You have spoken of a plan which you were in the habit of producing at the meetings of the Commissioners; had it any soundings upon it?—No.

2173. Did you ever, in any of the applications which were made for land, furnish to the Commissioners any information as to the real quantity of land to be taken or the abstraction from the tidal volume?—There was always a discussion as to the quantity. In this case it was small. Mr. Leslie's was only about half or three quarters of an acre. I do not know any other case since the new Commissioners entered upon their duties than Palmer's and Leslie's.

2174. Whenever the question was considered, was there always a discussion as to the quantity to be taken?—Yes.

2175. Did you ever furnish any information as to that quantity?—Yes, I did, respecting Mr. Palmer's.

2176. How long was it, after you were ordered to furnish that information by a resolution of the Commissioners as to the quantity to be taken by Messrs. Palmer, that you furnished it?—A considerable time, because there was a difference of opinion as to how far the grant was intended to go.

2177. How came that difference of opinion to arise?—I cannot say that. My view always was, that this meant that the entire extent from the west end of Jarrow Quay to the Muckhouse should be converted into land, and I knew it would be converted into land.

2178. Who were the parties with whom the discussion took place as to what the quantity of land was?—The River Commissioners, at their meetings.

2179. Who in particular? Did Mr. Philipson take part in that discussion?—I believe not, as to the quantity; he never interferes upon engineering points.

2180. I will ask you again, whether it is not within your knowledge that it has been a matter of discussion, in the Commission and out of the Commission, with Messrs. Palmer, whether the Commissioners did not assert, that the utmost extent of land granted to them was $4\frac{9}{10}$ths acres, or 5 acres, and whether Mr. Philipson did not assert that it was 15 or 20 acres?—There was that difference of opinion.

2181. But asserted by Mr. Philipson?—I am not satisfied whether he made that statement; not as a Commissioner certainly.

2182. But he is the solicitor of Messrs. Palmer?—He is.

2183. And is a Commissioner?—He is a Commissioner now, but was not a Commissioner for a considerable period.

2184. He was a Commissioner under the Act of 1850?—Yes, and then retired; and at the last election, in November, he was re-appointed by the Town Council. All the discussion took place when he was not a Commissioner.

2185. You spoke of the Chairman being very badly off. You said that his establishment was very shoal?—Yes, he suffered very greatly fromthe plan.

2186. Have you not found any means of compensating him in land?—He has never made any claim.

2187. There is not any land there that would compensate him?—No; he would not get any.

2188. Has he got any dredging done yet?—Not yet; he has been asking for it very hard, and he deserves it.

2189. Since when has his establishment become so bad that it requires this dredging which he deserves to have?—When these jetties were carried out and the alteration was made on the opposite side, the immediate result was to make shoal water abreast on the south side of the river opposite that gentleman's and the works of other parties on Jarrow Quay. That was the natural consequence of the diversion of the course of the ebbtide; a sandbank was formed and the channel went altogether to the north, and they now ship their coal in a swatchway, instead of what was the main channel; there is no outlet at the west end.

2190. You have referred to the leave that was given to execute these jetties; I will ask you whether they were not represented as being required for a temporary purpose, and whether it was not only upon that understanding that they were assented to?—You say "these jetties;" which jetties?

2191. The Hebburn jetties.—Yes, it was described as a temporary purpose; they are producing the effect, changing the course altogether.

2192. Although they were intended to be for a temporary purpose, are they not being filled up with solid land?—Certainly not; no deposit has been made there. Naturally a certain amount of silt will lodge behind them while they remain, but when they are removed the accretion will partly go away again. As I stated before, there will be below them shoal water; the deep channel will lie, as I have stated, more to the north, away from that shore on the south side.

2193. Then your understanding of the matter is, that these are really only temporary jetties, and will not be converted into solid land?—There is not the slightest intention of it; I should be sorry to leave them there. I have stated that the effect of that contraction is to give a depth of 20 feet water below the level of the datum tide in that region of the river; and I have no doubt that if the rest of the jetties were advanced in a similar proportion, we should have 20 feet water up to Newcastle by the contraction. I have laid out my lines with a view to further improvements above bridge on the removal of the old bridge, or a better discharge of the freshes, and when certain works are executed above bridge, and at the bridge itself, increasing the rapidity of discharge of the freshes, or diminishing the duration of the discharge, which is the same thing, then it will be found that the lines which I have laid down will not be too far apart; at present I am keeping on the safe side, I have not contracted the navigation.

2194. You referred to the successful operation of your jetties at the Tees, I think?—Yes.

2195. That they had produced an increase of water at Stockton?—Vessels could come up at neap tides of the same draught as formerly at spring tides.

2196. Was that due to your jetties?—Yes, and the new cut.

2197. Were not there two new cuts?—One new cut shortening the navigation, and the effect is, that the low water at Stockton falls down between 2 feet 6 and 3 feet lower than before the works were commenced; and the land floods which used on former occasions to overflow the quays of Stockton, now, unless they are unusually high, never go upon them; the freshes go more rapidly away.

2198. Did you recommend the cut?—No, the cut was recommended by my tutor, at the time I was resident engineer to it.

2199. You thought that the jetties would do there?—But the cut is quite a distinct thing, it shortened the navigation considerably.

2200. Was not that about the original state of things at the river when you made the jetties (*handing a Sketch to the Witness*)?—No, that is a very bad sketch.

2201. But had it not two bends like that?—The bends were still greater.

2202. However, the result of those jetties has been with the combination of the cut, the great improvement which you refer to, which I do not deny. I think you asserted before Mr. Walker, that the water fell at Newcastle Bridge a foot more than it used to do?—Yes.

2203. On that occasion, were not you challenged by Mr. Stevenson to prove it?—I do not recollect it, but I am in a condition to prove it.

2204. Was that assertion the result of tidal observations or not?—Certainly; not only the result of tidal observations, but the result of the tide gauge. Merchants residing on the quay can bear witness to the level at which the water now stands at low water. We have now at a low ebb 12 feet 6 inches rise at the quay at Newcastle, that is, from the low water up to the datum, instead of from 11 feet 3 inches to 11 feet 6 inches, as shown on Mr. Rennie's survey, and as also shown on the tidal observations made by Mr. Calver.

2205. At the time when you made this representation to Mr. Walker, I ask you whether you had any tidal observations?—I do not know the date.

2206. In 1850?—Yes, certainly; but subsequently a depression has taken place; this great depression has taken place since the removal of Hebburn Shoal. We have now the

W. A. Brooks, Esq.
27th January 1855.

same flow at Newcastle Quay with a clean ebb, as we had in the old state of the river at Hebburn, and I will prove it; this is not a mere solitary instance, but in general it is much better. I have seen low ebbs at Newcastle, where there have been very foul ebbs at Shields, showing that the water gets away, and I shall be able to prove that the water gets away better even in Shields Harbour.

2207. You have spoken of this large plan which has been produced from time to time before the Commissioners. I think you say there were no soundings upon it at all?—No; but I had other soundings occasionally produced. I had some sheets with soundings.

2208. Were not you applied to repeatedly by the Commissioners that they should be furnished with longitudinal sections showing the state of things, and the real effect of these changes which you said were taking place in Hebburn Shoal?—They have been furnished; not frequently, because the soundings have not been taken frequently. The sand being in a shifting state, it would be a waste of money and time to make frequent soundings. The sand goes so rapidly away when the works are carried out.

2209. Have you ever at any time furnished to the Commissioners sections, either longitudinal or transverse, showing soundings?—Yes; both.

2210. When?—I forget the date. I now produce to the honourable Commissioners a longitudinal section of the river taken in January 1852. It has upon the same plan a longitudinal section of the river, which has the date upon it of 1816, which is the time of Mr. Rennie's report, but the date should be 1813, because the surveys were taken from Messrs. Giles and Comrie's plan. That plan shows Hebburn Shoal. There is another plan of the same date, showing a portion of the Long Reach. This is another portion of the Long Reach.

2211. And they are all longitudinal sections?—Yes; and the reach higher up is shown.

2212. I think you have always contended that longitudinal sections are the only ones worth having?—Never anything of the kind, because I know transverse sections are also requisite. These soundings are taken from transverse sections.

2213. Have you not repeatedly at the meetings of the Commissioners, when asked for both longitudinal and transverse sections, asserted that transverse sections were of no use, and that longitudinal sections were the only ones necessary?—I have no recollection of the kind.

(*Chairman.*) It is hardly possible that he could have stated such nonsense.

(*Mr. Webster.*) It is asserted, Sir.

2214. (*To the Witness.*) Are you of opinion that in taking these transverse sections, they ought to be taken directly across the channel, or obliquely?—Directly across the channel; but if you use it to take the form of a shoal, then it would be advisable, in addition to that, to take it along the line of the shoal, or the crest of the shoal.

2215. Were not you of opinion in 1849, when it was suggested by Captain Washington, that cross sections of the river should be taken, that such sections were of no use for testing the capacity of the river?—Exactly, unless they are very close together, because a shoal may exist between. You only get them correct by getting the lines close together. I illustrated that by my evidence with regard to Tyne Main Shoal. The soundings on Mr. Rennie's chart do not show the Tyne Main Shoal, though it is notorious that it existed; they also do not show Howdon Shoal, though Howdon Shoal in like manner existed.

2216. Then the objection which you took was not to transverse sections, but because there were not enough of them?—Just so, the more there are, the better; I will bring a large plan on Monday, showing my survey of the river above bridge, with very close soundings, in which it will be seen that where there is a shoal existing, I multiply my lines across it, and show that I get a more correct contour of the shoal.

2217. Did you also contend then, in answer to the objections which were made to the state of the channel, that it was the longitudinal sections which were sufficient for the purpose, and that transverse sections were not required?—A longitudinal section, if closely taken, would show the available depth of water, but it would not show the direction of the course of the channel, where a transverse section becomes necessary.

2218. But would longitudinal sections without transverse sections show the capacity of the river for tidal water?—No, they would not show the tidal capacity.

2219. In this report of yours in 1842, you state, "In the improved state of the navigation of the Tyne, consequent upon the construction of the above-described works, there will not be found to exist a difference of more than 18 inches between the rise of tide at Newcastle and that which takes place a Shields; so that with a flow of 15 feet at the latter place, there will be 13 feet 6 inches at Newcastle; and if to the latter be added the available depth at low water, which will be obtained by the improvement, I think it quite reasonable to expect that the proposed outlay of 17,000*l.* will enable vessels of 17 feet draught of water to reach with facility the quay at Newcastle in ordinary spring tides." You reported that, I think, in 1842?—Yes; I have got for the harbour what I proposed then. As regarded the depression of the low-water surface.

2220. I am asking you about 17 feet draught of water to Newcastle?—Yes, a vessel could come up of 17 feet draught to Newcastle quay at this moment. I would engage to pilot the vessel up myself, though I am not a pilot, but an engineer.

2221. Has any vessel ever got up drawing 17 feet?—No; but a vessel drawing 16 feet has got down from Dent's Hole; and that draws my attention to a part which I have omitted, and I beg to be allowed to give some account of the dredging operations which took place

to get this vessel down. The fact is, the frigate was a very valuable vessel, worth somewhere about 60,000*l.* To take a vessel down of that value, it would have been very unwise to trust her with only a foot water under her, although there is in the channel that which is requisite for the ordinary trade of Newcastle, and inasmuch as the channel immediately below the Pelaw main staiths was narrow, though there was fully 17 feet water upon it, it was advisable, as I stated to the Commissioners, to widen that channel. The consequence was, that the dredger was put to work for several weeks, and she took up a great quantity of ballast mixed with coal. There had been a deposit arising from, I suppose, the coals lost at the numerous staiths immediately above; certainly one-third of the quantity raised was altogether coal.

2222. You represented that if these jetties at Hebburn Shoal were allowed to be extended as you proposed, they would be sufficient for the purpose of improving the channel. What is the extent of dredging which has taken place there since those jetties were put up?—None; since the jetties were lengthened to the extent advised by me, there has been no dredging.

2223. Since they were first commenced?—That is another point.

2224. You represented that these jetties would be sufficient to clear the channel without any dredging?—That has been the result.

2225. I ask you what amount of dredging has taken place in that channel since that report, in which you made that representation?—I say none. The dredging was immediately below, to widen the channel at Coxlodge; where the depth was 9 feet at low water in the channel, it was considered wise to widen that channel; there the dredging took place. There has been some little dredging considerably above the shoal, opposite Miller, Ravenhill, and Company's ship yard; they had occasion to launch a vessel of 337 feet in length, and as she would dip considerably, it was necessary to dredge the track in the line of her course; that was done.

2226. Have you what is called a dredging book?—There is one.

2227. Perhaps you will produce it on Monday?—I will; the only dredging on the Hebburn Shoal was when the jetties were intended; when they were formed there was no occasion for any further dredging.

2228. These advantages from the jetties, as you represented in your report of 1842, were to be obtained at the cost of 17,000*l.*, and in two years?—Yes; I could have executed those certainly in two years, if I had been allowed; one work was executed in less than two months, at a cost of about 800*l.*

2229. There has been considerable discussion in the Commission or in committees of the Commission about these river walls; excepting that large plan and pencil marks which you used to put upon it from time to time, has there ever been any plan or any detailed working drawing of any of the works which you have been carrying on?—There has; there was the original plan and the one which was made at the same time as Mr. Rendel gave his river lines; it is now lying upon the table; I had better put in that plan giving Mr. Rendel's line at once.

2230. Excepting that large plan which you have produced as the plan which is in use by the Commissioners, I ask you whether you have any other plans, or have been in the habit of producing any plans showing the contemplated works?—What contemplated works?

2231. The embankments and jetties.—When jetties have been made.

2232. Has not your practice been to produce that large plan, and when works have been under discussion to mark in pencil upon it the position and nature of the works?—No.

2233. Excepting such pencil marks upon the large plan or on a similar plan, have you ever made any plan or laid before the Commissioners any plan of any works which you projected?—Yes, very large works. I will bring on Monday detailed drawings of the piers; the other works are rubble walls and things of that sort, which do not require working drawings.

2234. Or any estimate?—The Committee know the cost of them; they know every week that they pay 9*d.* per ton for the stone or the chalk.

2235. The Commissioners know, after they have paid it, the cost; but you have never made any estimate before the works were begun?—These are formed upon the shifting sands, and any estimate would be very inaccurate. Supposing, for instance, I took the river in its present condition, and there would be deep water, the bed of the river may be deeper during the commencement of the work; but as the work advances, or in the way I have arranged it, the bed materially changes its condition, it becomes very shoal; so that, supposing I were to make an estimate of the quantity or number of tons of material which would be required to form a stone wall in the then existing state of the river, it would be very fallacious, because it might take very much less.

2236. Then your practice has been to tell the Commissioners what works you thought ought to be done, and to execute them from time to time?—Yes, according to the directions of the Commissioners; the works are exceedingly simple in their nature.

2237. You have adverted, all of a sudden, to the subject of the piers. I think you said, in answer to a question by one of the Commissioners, that you had a tender for your works within your estimate?—Yes.

2238. Are these piers, which are sanctioned by the Admiralty, and which Mr. Walker is now carrying out, at all like the piers which you estimated for?—The pier on the south side is a mere rubble pier.

W. A. Brooks, Esq.
27th January 1855.

(*Chairman.*) Had we not better postpone the pier question, because on Monday the Chairman of the Conservancy will produce the correspondence?

(*Mr. Webster.*) If you please, Sir.

(*Mr. Brooks.*) And I shall produce the plan at the same time, if the Chairman will allow me, and the drawings.

2239. (*Mr. Webster.*) And produce the plan of the ground of Messrs. Palmer's, and the licences which have been granted to them?—If any.

Adjourned to Monday next, at 10 o'clock.

Monday, 29th January 1855.

W. A. Brooks, Esq.
29th January 1855.

William Alexander Brooks, Esquire, further examined.

(*Mr. Seymour.*) Mr. Brooks proposes to put in some maps this morning, Sir.

2240. (*To the Witness.*) Will you state what they are?—The plan which now I produce before the Commissioners is by Fryer, dated November 23d, 1771, being one of the oldest records of the state of the Tyne; the oldest that I know of, with the exception of Collins' chart, who was hydrographer to the Admiralty in the time of Charles the Second. This plan shows a shoal of 2 feet in the reach above Bill Point; it shows 4 feet through Jarrow, that is, in the neigbourhood of Jarrow Shoal; it shows 3 feet in the neighbourhood of Killingworth; it shows also 3 feet at Hebburn Shoal; there are no soundings on the bar. This plan was submitted to the Tidal Harbour Board, when the inquiry was held here before Captain Washington, and a copy was delivered in, a tracing merely, which is now at the Admiralty. The next plan is an engraved chart of Shields Harbour, also by Fryer, from an accurate survey finished in 1772 and engraved in 1773. It shows 8 feet on the bar. The sounding, which is shown on the original survey, is left out of it. I shall beg to call the attention of the Commissioners to that circumstance. The original chart, which was bought by the late Conservators after the Admiralty inquiry, has only 7 feet upon it. Plan No. 3, which was handed in to the members of the Tidal Harbour Board, is by Fryer, surveyed in September 1787; it is a survey of Shields Harbour; it shows a passage of only 180 feet wide, between the Middle Ground and Clifford's Fort, and it shows the whole of the system of mooring ships in the river, which is quite distinct from the present system. On the bar it shows 8 feet water at low water; it shows a passage of only 200 feet wide between the Stones and the Herd Sand; between 5 feet water on the Stones and the water on the other side. The object in putting in those plans is to show the bad state of the navigation at that time. I now put in several plans belonging to Mr. Rendel, which are referred to in the appendix to his report; his general plan above and below bridge; there is also a chart with soundings upon it in Jarrow Slake, and another plan from the same collection, showing Mr. Rennie's proposed pier on the Herd Sand. I put in my large detailed survey of the river above Tyne bridge, to which I referred on Saturday in my evidence, showing where I took the soundings over the shoals; that survey is of two chains to the inch.

2241. (*Mr. Brunel.*) Made when?—In 1849. I put in two plans made by Mr. Walker; the one shows the proposed piers contemplated by that gentleman, and the other shows transverse sections of the same. The next is a general plan of the mouth of the river, showing the proposed piers and the contemplated alterations.

2242. (*Mr. Armstrong.*) Are these plans all by Mr. Walker?—No; this last one is by myself, showing the same piers as those settled by Mr. Walker, with the proposed changes round Tynemouth Fort, excavations, so as to make it more in the form of a bastioned fortress. The stone to be excavated round the castle, which is a great height, will be put into the body of the northern pier. Here is another general plan, which has been used very much.

(*Mr. Webster.*) None of these have been adopted, Sir. I believe Mr. Brooks has had some twenty schemes for these things.

(*Mr. Brooks.*) This is one of Captain Purdo's. I have not been able to find as yet the original plan of the application from Messrs. Palmer, but I produce a copy of the same used on the occasion, and it shows the application. This shows how far the jetty was set back. This (*another plan*) is a plan which also accompanied it, signed by the Chairman. That shows the manner in which the business was conducted.

2243. (*Mr. Webster.*) This is the plan which you produce; have you no other plan than this relating to Palmer's, and Ellison's, and Leslie's encroachments?—I have not found the original yet, but the plan which you speak of is the same.

2244. This is a plan of the staith, I understand?—Yes, the second application; it shows the former application upon it.

2245. Is not this staith which is shown here beyond the limits of Messrs. Palmer's enclosure altogether?—The open piles go into the river.

2246. I observe that this staith is land belonging to Cuthbert Ellison, Esq.?—Yes.

2247. Whatever it may be, these two plans relate to the staith?—They do.

2248. And they are signed by the Chairman, "Joseph Cowen, Chairman, 21st November 1854"?—They are.

2249. I ask you for plans of nearly two years' prior date, when this matter was under discussion?—That you shall have produced. I have hunted up a great many old plans.

2250. These I do not want; so far as I am concerned you may take them back. I want the original plans about the time of the first application, and upon which the discussion took place with Mr. Philipson?—You shall have the originals.

2251. (*Chairman.*) Cannot you send for them?—I will send for them.

(*Mr. Seymour.*) I will undertake that they are produced to the Commissioners.

2252. (*Mr. Webster.*) What I want is the original plans, and particularly that one which had the pencil mark of the Chairman, which was produced at the view, when some understanding was come to as to the extent of the land that Mr. Palmer was to have.—It has been already promised.

2253. You know what I want?—Yes.

2254. And which plan was the subject of discussion at a subsequent meeting of the Commissioners, when Mr. Philipson contended that the original grant extended to fifteen acres instead of only five. You also were to produce some licences, I think,—the form of licence which had been given of this land to Mr. Palmer?—I have not got that here.

2255. The Town Clerk will have it, I suppose?—I think it was stated in my reply that there was no licence already granted; there is nothing beyond a resolution of the Commissioners.

2256. Was it the practice, prior to the Commission, merely to grant licences by resolutions without plans signed by some authority? was that the practice in the time of the old Corporation?—Sometimes, where there was an urgency, staiths were commenced. They consulted very often the interest of the parties, and so they would not stop upon a demand for a staith, and threw unnecessary impediments in the way of works which could not materially influence the navigation.

2257. Then the general practice was, on application, to allow the works to go on, and then, at some time subsequently, to have formal plans and formal licences?—I made no such statement. Not the general practice—those were exceptions.

2258. I observe this was stated in the course of your examination in the Inquiry of 1848 before Captain Washington, at page 72, that it was the practice of your predecessor, Mr. Anderson, when he prepared a plan, to colour the line of projected works red, and to sign and date the plan. I wish to know whether that was ever your practice as regards these encroachments?—Will you read the question again?

2259. "It appears from this plan," a plan being produced before Captain Washington, "that it was the practice of your predecessor, Mr. Anderson, when he prepared a plan, to "colour the line of projected works red, and to sign and date the plan." Has that ever been your practice as regards these encroachments?—The plans are generally prepared by the parties when they make the application, and then I am desired to report upon them. They are their plans, not mine.

2260. Then the practice has been for the parties to bring their plans, and has it been the practice of the Conservators to keep copies of them?—The Conservators keep the original when it is granted. The parties apply and state what lands they want, and then I am desired to report upon it, which I do at my earliest convenience.

2261. The practice being for the parties to apply with a plan, and for you to report upon it, did you ever report upon Messrs. Palmer's application to the Commissioners?—I forget at this moment whether there was a report.

2262. The clerk of the Commissioners will know if you did?—Yes; I forget at this moment, there are so many reports that I have written.

2263. Not many upon Messrs. Palmer's case, I suppose?—No; but many altogether.

2264. You have told me that the ordinary practice was for the party to apply with a plan, and for you to report upon it; and of course the report will be in the possession of the clerk of the Commissioners?—Upon which plan are you putting the question, the first or the second?

2265. Upon the one relating to the grant of land, and not to the staith; the one in respect of which you reported after some more than nine months' interval that the quantity of land was $4\frac{9}{10}$ths acres?—Upon that point I may state, that the resolution was come to on the ground by a few of the Commissioners; it was settled there and then; I had no reason to make a report, because I verbally reported; the thing was settled, and the line was drawn upon the plan.

2266. (*Mr. Armstrong.*) Do you mean upon the ground?—Yes.

2267. You went down to the place to view the works, and it was granted there?—Yes; the Commissioners agreed with my representation. The only point was as to settling the line to agree with new alterations in respect of the dock; therefore it was settled to cut back one of my jetties about 30 feet.

2268. (*Mr. Webster.*) You said on Saturday, that so far as that ground went you did not wish to have any river wall or river works at all between the point of Messrs. Palmer's encroachment and Messrs. Leslie's, that you thought it unnecessary?—I have not said that, you are mistaken about points; what I said was this, that in the upper part where the deep water existed, with a concave side, I had no anxiety to make any enclosure. The 44 acres were urged to be made by some members of the Commission, as a trial of the half-tide work; the main part I wished enclosed.

2269. Have not you stated several times, in answer to objections by the Commissioners, from Mr. Straker, for instance, in particular, that it was unnecessary to have a wall between

W. A. Brooks, Esq.

29th January 1855.

Messrs. Palmer's and Messrs. Leslie's property, or some considerable portion of it; and did you not say that it was essential that that should be enclosed in land, that there should be a wall there, and that it should be made into solid land?—I have said it was so little essential that it might be deferred to any time, that it would not matter, that being a part where deep water was existing.

2270. You are aware, I think, of Captain Purdo having applied at meetings of the Commissioners for the area of the encroachments to be furnished?—He has made several applications.

2271. Did you receive at any time a communication from the clerk of the Commissioners to that effect, or did you hear Captain Purdo at the meeting?—I heard Captain Purdo at the meeting; I was present.

2272. I think it was nearly a twelvemonth from the time the first motion was made until it was finally disposed of?—I believe it was.

2273. Did you agree in the opinion expressed by Mr. Rayne, on 23d March 1854, that it would be dangerous to furnish such information?—No; my only view was that it might be so far dangerous that private parties might be perhaps subjects to legal processes. I believe that was the meaning of Mr. Rayne, and it would be my view too. Supposing they had commenced these works without receiving the sanction of the Admiralty, they might have been liable to a penalty; that was the meaning, I believe, of Mr. Rayne, it was my view also.

2274. Mr. Rayne was here the other day and made some contradiction of what had passed; but I simply ask you whether you thought it was dangerous on public grounds?—Not at all on public grounds; simply that it would be the means of harassing a number of private individuals.

2275. And you never had any objection to furnish it?—Not myself.

2276. Could not you have furnished it in a very little time?—Not in a very little time, the ground was so exceedingly irregular; the motion went to a period with which I had no acquaintance.

2277. In 1840?—Yes; I really could not myself have done it.

2278. But you had a plan which would show all this?—No, I had not; I must have gone to a great deal of trouble.

2279. Are you not aware that both the old Corporation and the Newcastle party in the present Conservators have always been opposed to any such information being given?—Nothing more, I believe, than upon that principle.

2280. Of its being dangerous because prosecutions might be instituted against individuals who had encroached?—I do not speak of the Corporation's opinions; that was the opinion of one gentleman. I know what Mr. Rayne said, and what my own opinion is.

2281. Any objection that you may have had to furnish that information was derived from personal consideration, or the possibility of prosecutions being instituted against individuals?—Yes; but I did not raise any objection.

2282. I did not make any imputation upon you. So far, then, as you were concerned, you never had any objection to furnish this information?—No; and I never raised any.

2283. Then how came it to pass that, having been ordered by the Commissioners to furnish that return, you waited a twelvemonth?—From the difficulty of making it, as I stated to you before, not having the information, and being so incessantly engaged.

2284. Did you ever at any meeting of the Commissioners, or to Captain Purdo at any time, allege the difficulty of making it, as the ground for its not being supplied?—I forget.

2285. You were to give me on Saturday what would be the area of the water surface between your walls, supposing they had been carried out as laid down upon the plan referred to, and which accompanied your report of 1842 or 1843?—It was so late on Saturday night that I did not have time. I shall take care to hand it in to the Commissioners.

2286. Am I to understand you to say that this plan of 1842, which accompanied your report, shows the river lines down through Shields Harbour to the sea and up to Newcastle, which you have adhered to? Are these your river lines, as they are called?—They are my original river lines.

2287. Are these the lines which you now approve of?—Not with respect to Shields Harbour.

2288. Have you not altered them as regards Shields Harbour since that time?—No; I have formed no fresh lines regarding Shields Harbour.

2289. You told me on Saturday that the river lines, in your opinion, had been virtually agreed to, though there might have been no formal resolution of the Commissioners to that effect?—Yes; where the works have been executed.

2290. Then has the practice been that you should execute the works, or that the works should be executed, and that then the river lines in relation to them should be agreed to?—No; the general principle was agreed to.

2291. This plan, which accompanied your report of December 1842 or January 1843, contains river lines?—Yes.

2292. Are these the river lines which you then approved of, and which you now approve of?—No; because changes have been necessary to be made, as in the vicinity of Hay Hole Dock.

W. A. Brooks, Esq.
29th January 1855.

2293. I observe in the vicinity of Hay Hole Dock that your river lines come out pretty nearly to the line of the present wall. What are those two lines?—It is quite different. The original river line by me shown on this plan goes close by the staiths into the bight. Now they vary about 300 feet in one part.

2294. Then this plan does not show the present river lines?—No; not in that part of the river, because they are naturally changed.

2295. Which are the river lines which you told us were virtually settled by the Commissioners?—I have never said that the Commissioners had passed any resolution upon the general body of the lines; the works were in execution in different parts of the river when the Commissioners entered upon their duties, and they have never given me any instructions to suspend those works.

2296. At White Hill Point, your river line, as shown upon the plan of 1842, coincides very nearly with Mr. Rennie's river line?—It does. That is a theoretical line with regard to cutting off White Hill Point, which, upon subsequent reflection, as regards the trading interests of South Shields and the general interests of Shields Harbour, and the general interests of the river, it would be very unwise to adopt.

2297. The lines shown upon this plan of 1842, which I certainly understood on Saturday was the one on which your river lines were nearly the same as Mr. Rennie's river lines?—Very nearly.

2298. At all events, at White Hill Point they are the same as Mr. Rennie's river lines?—Yes, very nearly indeed. Being more intimately acquainted with the state of the navigation, and with the true state of the tide in Shields Harbour, my opinion is now, that this place called White Hill Point, which appears narrow on the chart, does not, in effect, so obstruct the tidal column as many other parts of Shields Harbour, on account of the number of ships which are therein moored. The heavy tiers in North and South Shields offer, I believe, a greater resistance to the passage of the tide than the Narrows itself, or than the part opposite White Hill Point, where the water is very deep, and where there are very seldom more than three or four ships lying.

2299. I will read this passage from your report. "The blue lines on the accompanying "plan represent the improved navigable channel, which I have the honour to be allowed "to submit as a substitute for the channel described by Mr. Rennie, for this division of "the river".—Yes.

2300. Then so far as regards White Hill Point, you did adhere to Mr. Rennie's lines?—Yes, at that time. That is a plan which might be adopted when wet docks were constructed, which would supersede the necessity of vessels lying in the harbour. This remained in abeyance. As an engineer, I should wish certainly to adhere to the principle of cutting off White Hill Point, if it can be executed without injury to the trading interests.

2301. Was this the plan which was produced before Captain Washington, in the Inquiry of 1848?—It was.

2302. This was the standard plan?—Yes.

2303. Was this the plan which Captain Washington objected to receive, as having the works upon it sketched only in pencil, and on which there were no soundings marked, or sections given?—That is the original plan, you can form your own judgment whether it is in pencil or in ink; I say in ink.

2304. (*Mr. Armstrong.*) That is not an answer. The question is, whether Captain Washington made the objections to that plan which the learned Counsel puts to you?—That is the plan.

2305. (*Mr. Webster.*) At page 67, I will read what takes place; the witness produces a plan, which he says is this plan, having the blue lines. "*The Inspector:* I object, on the "part of the Admiralty, to receiving any plan on which works are only sketched in pencil, "and on which there are no soundings marked or sections given." Now, I will ask you whether you, either then or at any time subsequently, produced at meetings of the Commissioners any plan, with works shown otherwise than in pencil, or with soundings or sections upon the one plan?—Yes, that plan contains the works in ink.

2306. This is the Commissioner's plan which you referred to?—Yes.

2307. There are no soundings or sections on this plan at all?—None.

2308. Will you have the kindness to go and look at White Hill Point on the plan, immediately behind the learned Recorder, of Manchester?—I see it.

2309. I will ask you whether that was not the river line, the blue line proposing to cut off White Hill Point to, I think, 100 feet or more beyond Mr. Rennie's line, which you produced before Captain Washington, as your then river line at that point, and which you produced before the Committee of the House of Commons in 1849, as your then river line?—I rather think this is the opposition plan; not by myself.

(*Chairman.*) It is not fair, I think, to tie Mr. Brooks down to a plan which is not his own.

(*Mr. Webster.*) I was not going to tie him down to a plan which is not his own, Sir, but merely to ask him whether, in the whole contest before Captain Washington and also in Committees of the House of Commons in both sessions, he did not then propose to cut off White Hill Point to 100 or 150 feet, or at all events a considerable distance within Mr. Rennie's line.

(*Chairman.*) I wish to ask whether you have anything more than inconsistency or change of opinion to show.

W. A. Brooks, Esq.

29th January 1855.

(*Mr. Webster.*) The object is this, Sir. The complaint of the minority of the Commissioners has been, that there never has been a plan for the Tyne at all, so far as Mr. Brooks was concerned, and that all Mr. Brooks has done, either under the old Corporation or under the Conservators since, has been but a continuation of the old system, Mr. Brooks doing pretty much as he liked, there never being anything like a consistent plan; and to show that before you, I am endeavouring to point out what have been Mr. Brooks' inconsistencies as regards river lines.

(*Mr. Armstrong.*) Repeat your question about White Hill Point.

(*Mr. Brooks.*) Originally, I proposed to cut off Hay Hill Point.

(*Mr. Webster.*) No; White Hill Point.

(*Mr. Brooks.*) That plan does not agree with any plan proposed by myself.

2310. (*Mr. Webster.*) Your river line in the plan accompanying your report of 1842, so far as regards Hay Hill and White Hill Point, coincides nearly with Mr. Rennie's?—No, it does not; you said "Hay Hill and White Hill Point."

2311. Then White Hill Point only?—There it agrees, I believe, very nearly; but at Hay Hill Point my line is within the point, or landward of it, and Mr. Rennie's went without. There is considerable variation in the original plan of mine.

2312. In the Inquiry before Captain Washington did you not make a mark on the plan in pencil, by which you proposed to cut off White Hill Point to a considerable distance within Mr. Rennie's line?—I believe not.

2313. I will refresh your memory by reading this paragraph at page 68. "*The* "*Inspector:* Who is the owner of the land at White Hill Point?" "The Duke of Northum- "berland." "Is it not very desirable to remove White Hill Point?" "I think so; I believe "every engineer will concur that it is a great obstruction to the Tyne." "Have any steps "been taken to remove it?" "No." Did not that pass before Captain Washington?—Yes, it did, and I have given my reasons why I did not remove Whitehill Point, on account of the trading interests.

2314. In the evidence on the Tyne Navigation Bill, before the Inspectors, at question 10,025, on 2d March 1850, were not you asked,—"Would you recommend therefore "the removal of White Hill Point?" "Yes, as an engineer, certainly I should recommend "it?"—Yes, certainly, as an engineer, provided it did not affect the trading interests of South Shields; it would destroy all the berths on that shore, I believe.

2315. Then is this change of opinion, or apparent inconsistency of opinion, due to the supposed interests at South Shields, where parties have objected to removing White Hill Point, because they supposed it would interfere with their interests at South Shields?—It is mainly due to those interests, and to the general interests of the Port, because if you shoaled up the useful berths in South Shields, you would inflict a very great injury indeed.

2316. Then is it true that there has been a conflict of opinion between you as engineer of the river, and the interests at South Shields on this point?—As engineer to the river I believe that I am bound to take also into calculation the great trading interests of the port; not to adhere to plans which, however theoretically they may be superior, would produce great injury to the port.

2317. Did you ever see a plan of the manor of his Grace the Duke of Northumberland at Shields, bearing the name of F. Thompson, and dated 1757, produced before Captain Washington, and marked No. 5 in the list at page 44 of the Inquiry?—I do not remember to have seen it, but it is most probable I did.

2318. I will just read this paragraph, perhaps it will recall it to your recollection. "According to this plan it would appear that White Hill Point had been extended con- "siderably into the river, since the time of the survey not less than 60 or 70 yards, "according to this old plan, and the line as laid down by Thompson appeared to coincide "very completely with Rennie's line." Do you remember that?—I do not remember it, but it is very probable.

2319. Having called those facts to your recollection, did you not at that time propose to cut off White Hill Point to the extent of 60 or 70 yards within Mr. Rennie's line?—In every plan that I should take, even with my own views at the present moment, theoretically as an engineer, I should lay down a line to cut off White Hill Point, if called upon to produce the best line for the tidal column for and the channel to; but as an engineer, I should consider it my duty to point out the consequences which would ensue to the trading interests.

2320. You were examined in 1849 before Captain Washington, upon the North Shields Quays and Improvement Bill, were you not?—I was.

2321. Do you remember being asked by that gentleman, at page 21 of that Inquiry, "State your engineering reasons for departing from Rennie's line," this is in Shields Harbour, "because that has been considered a standard hitherto?" "When Rennie laid down the "plan of improvement for Shields Harbour, he did not go, I consider, on the true "engineering principles to most effectually remove the Insand." Was that answer given?—I believe it was.

2322. I will ask you whether that plan which you have there, which was produced before Captain Washington, so far as the plan goes, is not upon Mr. Rennie's line for Shields Harbour?—It is not so; but it is generally.

2323. This was the plan which you produced before Captain Washington?—Yes.

2324. (*Mr. Brunel.*) The identical plan?—The identical plan, I believe.

W. A. Brooks, Esq.
29th January 1855.

(*Mr. Webster.*) On the ink plan produced before Captain Washington, the line at White Hill Point coincides with Mr. Rennie's line. I have called attention to questions and answers before Captain Washington, which, as I contend, show that this gentleman intended then and also before Committees of the House of Commons to cut off from 50 to 60 yards within Mr. Rennie's line at White Hill Point.

(*Mr. Brunel.*) As a deviation?

(*Mr. Webster.*) Yes, Sir.

(*Mr. Brunel.*) And so put before Captain Washington?

(*Mr. Webster.*) Yes, Sir.

2325. (*To the Witness.*) I will just ask you whether this, which is at page 73 of the Inquiry before Captain Washington, took place? It was in answer to a question put by Mr. Nicholson, who was the engineer of the promoters, in cross-examination. "My line "at the entrance of Jarrow Dock very nearly coincides with Rennie's line. My plan was "made with the view of throwing the tide on the north shore. At the east end of Jarrow "Quay my line goes 366 feet north of Rennie's. At the west end of the quay, on the east "side of Jarrow shipway, where Rennie's line goes through the quay, mine extends about "165 feet, or 2½ chains, into the river. Opposite the Jarrow Spouts the difference is about "280 feet. It is part of a very large circle. I have not yet done anything to carry out "my line at Jarrow Quay." Then the Town Clerk, that is, Mr. Clayton, says,—"Are "not those plans submitted to Mr. Rendel for his decision upon them?" "They are." "(*By "Mr. Nicholson.*) Mr. Rendel will say how far Rennie's line and how far my line should be "acted on. If my plan should be approved by Mr. Rendel, I purpose throwing out "jetties." I will ask you whether at that time, in 1849, these plans, such as you were then submitting to the then Conservators, namely, the Corporation of Newcastle, were not subject and submitted to Mr. Rendel for his approval?—They were.

2326. I will also ask you whether this took place on the Shields Quay Inquiry. The Inspector asked you,—"Is there the least prospect of the lines you propose being carried "out?" "I hope so. I have strongly urged them on the attention of the Council. And this "plan was prepared with the view of taking the opinion of Mr. Stephenson and Mr. Rendel. "In case of its being approved by them, it is intended to make an application to Parlia-"ment at an early period. The plan was prepared before notice of the present Bills was "given." "I think on the 1st of August you laid down a breastwork for extending further "out?" "I did." "Perhaps you will explain your reasons for then extending out, and now "receding?" "At that time I certainly had not a plan of the works above, which I "could submit to you." I ask whether that took place before Captain Washington?—I believe it did. I have given one observation with regard to my plan, coinciding nearly with Mr. Rennie's. I find abreast of the Middle Ground that my line does go beyond his, with the object of acting more effectively upon the Middle Ground and the Insand. That is where, I believe, I refer to Mr. Rennie's plan as not being well adapted to act upon the Insand.

2327. I will ask you whether the plan of 1842, or the plans which you produced before Captain Washington, which I suggest are according to the blue lines as shown upon that large chart, have ever received the approval of Mr. Rendel?—No.

2328. Have they ever received formally the approval of the Commissioners?—No; but those lines have been materially changed.

2329. There have been two Committees upon what have been called the river lines?—Yes.

2330. The one Mr. Robinson's Committee, and the other the Chairman's Committee, or Mr. Allhusen's, I believe?—Yes.

2331. Did those Committees either of them come to any determination upon the river lines?—They did; but the plan which they adopted was not to act upon the blue line as shown in that plan, because the dock had been agreed upon, which materially changed the river lines in that part of the river; the line cuts off no portion of Hay Hill Point.

2332. I believe upon the Inquiry on the Jarrow Dock Bill, you advocated the cutting off of Jarrow Slake, on the ground that the channel above might be so adapted, that the water excluded from the slake should go up the river?—Yes.

2333. Since the plans for cutting off Jarrow Slake, and for the Hay Hole Docks, received the sanction of Parliament, have the river lines ever been adjusted by you, with reference to the requisite alteration?—No, that part I left open, because I have not yet got the Admiralty lines. In the last Jarrow Dock Bill, the line was to be settled by the Admiralty, and I have not yet seen the line, and that part of my plan is left in abeyance.

(*Mr. Armstrong.*) The Jarrow Dock Bill was in the last Session of Parliament.

(*Mr. Webster.*) Yes, Sir, I refer to the former one.

2334. (*To the Witness.*) Do you remember docks having been sanctioned in Coble Dean?—I do.

2335. Is Coble Dean what I may call the upper part of Shields Harbour, immediately below White Hill Point?—It is.

2336. And does Coble Dean lie between White Hill Point and Smith's Quay?—It does.

2337. Is it not the fact, that when the Coble Dean Dock was sanctioned, the Corporation of Newcastle required that the dock should come out to Mr. Rennie's line?—I believe they did. What is the date when the dock was carried out?

2338. I do not know. Let me read this paragraph to you, at page 40 of the Inquiry before Captain Washington. Mr. Nicholson says, "The west end of the quay at Lime-

W. A. Brooks, Esq.
29th January 1855.

" kiln shore, appears to be 280 feet within Rennie's line. From the west end of Smith's " Quay to White Hill Point, a dock was proposed to be formed, called the Northumberland " Dock. An Act of Parliament was obtained, and I was engineer for it, and on that " occasion I was required by the Corporation engineer to adhere to Rennie's line." Is that the fact?—Yes.

2339. The dock then proposed to be erected in Coble Dean, was proposed also to be called the Northumberland Dock, was it not?—It was.

(*Mr. Armstrong.*) Then Coble Dean Dock was a work never executed?

(*Mr. Webster.*) No, Sir. An Act of Parliament was obtained, but the Corporation of Newcastle stipulated that they should come out as far as Mr. Rennie's line.

2340. (*To the Witness.*) How far was Mr. Rennie's line beyond what you thought the proper line at that time at that place?—I generally approved of Mr. Rennie's line. I generally approved in principle of enclosing the Coble Dean.

2341. Is this the fact, that when the Act for the Coble Dean Dock was in Parliament, " Mr. Smith opposed it, and said he was going to build a dock in continuation of Rennie's " line. Mr. Smith is now building a quay, which is not upon Rennie's line. Approaching " White Hill Point, Mr. Rennie proposed to take a considerable portion off White Hill Point, " about 200 feet?" That has not been done?—That has not been done.

2342. How far is that existing quay—Mr. Smith's, in Shields Harbour—within Mr. Rennie's line?—It is a considerable distance.

2343. Is it as much as 200 feet?—I should think it is.

2344. Then is the state of things this, as regards Shields Harbour, that when the Coble Dean Dock was before Parliament, the Corporation required that that company should come out as far as Mr. Rennie's line; but that Smith's Quay, which was then building, and has been built since, is nearly 200 feet within Mr. Rennie's line?—That is so; that is a small work; it was recommended by me that this quay should come out, but the parties had no disposition to go to that great expense, particularly also as it would subject them to damages from parties having quays below them; but the Messrs. Smith stated that if a general measure were carried out, enabling the rest of the owners below to come out, they would have no objection to come out to that extent; they have been quite willing, if called upon, to come to a general line.

2345. You have proposed a great number of different lines and different schemes for Shields Harbour, both as regards the South Shields side and the docks at the entrance, I think?—Yes, several engineering schemes.

2346. Perhaps you have had as many as 5 or 6 distinct engineering schemes for the treatment of Shields Harbour from time to time?—Three or four, I believe; one involved making a wet dock at South Shields, in the bight which Mr. Rennie had proposed to enclose.

2347. You were examined on the Inquiry before Captain Washington as to the quay at North Shields?—I was, I believe.

2348. Do you remember whether that was thrown out in the Session of 1848, on the ground that it would be expedient to wait until the Conservancy question was settled?—I do not remember that.

2349. Were the Corporation the opponents of this North Shields quay?—I believe they were.

2350. In the next Session was the application for a quay at North Shields renewed?—I will not dispute it. I forget at this moment.

2351. Did not Mr. Rendel approve of that quay, being then the adviser of the Corporation, and bring it out to about Mr. Rennie's line?—He did, I believe.

2352. Did not you, as the engineer of the Corporation, oppose that line of quay, and compel the parties to reduce it in extent one half, and also in width nearly 40 feet?—Yes, the line was set back.

(*Mr. Armstrong.*) It was obtained by an Act of Parliament.

(*Mr. Webster.*) Yes, Sir.

(*Mr. Armstrong.*) Then he objected, and weight was given to it.

(*Mr. Webster.*) Yes, Sir, it was so. Mr. Rendel, who was then the adviser of the Conservators as it was supposed, had approved that the quay should be brought out to Mr. Rennie's line, which was the line of the Coble Dean Dock, and also some other works in that neighbourhood; but Mr. Brooks, as the engineer of the Corporation, opposed it, and compelled the parties to set it back 30 or 40 feet.

(*Mr. Armstrong.*) That is to say, Parliament adopted his suggestion.

(*Mr. Webster.*) It was not opposed, Sir.

2353. (*To the Witness.*) Is this the fact, that the parties were glad to take all they could get, and that all they could get from you and the Corporation was a quay half the length, and set back some 30 or 40 feet, although the Admiralty and Mr. Rendel had approved it upon Mr. Rennie's line?—I do not know that the Admiralty approved of it; it was required to be set back; it was considered advisable for the shipping to deepen the channel, and allow more ships to lie there; and my own views as an engineer have been influenced by the plans which I have given for piers at the mouth of the harbour, in which I have changed my original intention of going further out at the point in question, having determined that the river line should be close to the lighthouse, and new works in the formation of piers, rendering that change capable of being carried into execution safely.

2354. Whatever the motive was, the advice which you then gave was, that the pier

should be set back some 30 or 40 feet beyond Mr. Rennie's line, and reduced one-half in length?—Yes.

2355. Did not that setting back and cutting off the end of the pier, render it worthless for parties to carry out?—No, I do not think that at all.

2356. Has it been carried out?—No.

2357. Has anything been done upon it?—No; but I do not believe that is the reason; I believe it is because they have not got money.

2358. I believe, in the Inquiry before Captain Washington, you stated that you had taken soundings, but that they were not recorded on any plan; when asked whether you had taken soundings you said, "I have taken soundings, but they are not recorded on plans"?—Yes.

2359. Was that the case?—Yes. I had frequently sounded the river; the sands were in a transition state, and any general soundings over the navigation, when in such a state, I considered useless, the sands were changing their form so very rapidly.

2360. Did you also state that up to that time you had taken some tidal observations and some velocities of the current, but had not recorded them upon a system, so that they could be compared?—Yes. I had none but what had been done by Mr. Rennie, upon which I acted.

2361. I think, at Question 9129, in the next year, you were asked whether the river was levelled with a spirit level from end to end, and you said, "No, it was not necessary"?—No, I took Mr. Rennie's statement, that the datum was a dead level throughout between the sea and Newcastle Bridge.

2362. And as late as 1850, in answer to a question of the same kind, "Did you take "any observations as to the velocity of the stream at particular times of the the tide," you said, "I observed it generally; I have not recorded any observations;" and also at that time you had no plan of soundings, and so far as regarded the tidal observations, you had observed with the eye?—At that time we had soundings of Mr. Comrie.

2363. At 9139 you are asked, "Are the soundings which you took at that time re-"corded upon any plan?" "No, they are not." And then at Question 9166, you are asked, "In 1842 what observations had you taken of the velocity of the ebb tide in the "Tyne?" "I have not made any regular set of observations." "9167. None except by "the eye, perhaps?" "By observing objects passing down, and timing them by a watch "between two points." "9168. You observed it with your eye?" "Yes; not what may "be called a regular series of observations?"—Yes, exactly so.

2364. Was that the state of things in 1850?—Exactly so; they had got the information by Mr. Rennie, given on his plan as to the rate of his current.

2365. On your examination in the House of Commons in 1849, did you not object, that where the stream of the river is oblique, a cross section would not give the true power of discharge in that part of the river?—Yes; I stated so, and I state so now.

2366. Did you also then state that Captain Washington had suggested that cross sections should be taken, but that you had told him that such sections were quite unfit to test the capability of the river?—Yes; I will explain if you please. I mean that if you wish to test the discharge of any part of a river, where there is a shoal which makes a bar, running from side to side, or obliquely across the river, then it ought to be considered the same as you would consider an artificial weir built across the river, and therefore you would take the discharge along the line of the weir, and not in two lines, which might happen to be one above the weir at the end of it, and the other below it; that, in point of fact, it would give no true estimate at all; such an estimate would only be said to be correct where the current runs straight.

2367. Then, in point of fact, you never made any observations except by the eye, even of the oblique sections, to enable you to test the current of the river?—I had taken observations, as I have stated before, in floods in passing down; and I had before access to Mr. Rennie's plan, showing the rate of the currents.

2368. Did you not assert to the Committee of the House of Commons, upon those occasions, that nothing but these longitudinal sections would give you the state of the river, that the cross sections would give you a false idea in estimating the discharge and the capability of the river?—That is in reference to this question of the shoal across the river.

(*Chairman.*) You must recollect that the witness has already refuted any such idea as that of a survey of the river being correct upon longitudinal lines without transverse sections.

(*Mr. Webster.*) I have merely to prove the consistency or inconsistency.

(*Captain Fitzroy.*) May I ask whether the proving consistency or inconsistency in any one witness has anything to do with the present state of the Tyne?

(*Chairman.*) I think we had better allow Mr. Webster to go on.

(*Captain Fitzroy.*) It seems to be so personal instead of practical.

2369. (*Mr Webster, to the Witness.*) I believe that on the same occasion Mr. Rendel was examined, and he had then cross sections under examination, for the sake of ascertaining the capacity of the river?—I believe he had.

2370. In your report of 1842, you state that an expenditure of 17,000*l.* would give you 17 feet water to Newcastle?—Yes.

2371. But in that report, you made no mention of dredging, I think, at all?—No.

2372. Can you tell the Commissioners how much money has been spent upon dredging

W. A. Brooks, Esq.
29th January 1855.

in the river, between that time and the present?—I can lay before the Commissioners a statement of it. I will do so. I have not it here, but I will have one prepared; it is in the accounts, the accountant of the Conservators has the accounts, and will lay them before the Commissioners.

(*Mr. Webster.*) Mr. Stevenson, the witness, proved from the accounts since 1850, an expenditure, I think, of 17,000*l.* in dredging.

2373. (*To the Witness.*) You have made a considerable reference to the pier question. I will merely ask you, until I have had an opportunity of examining the plans, this question, whether you went with Messrs. Robinson and Clay to London, to the Admiralty, on the subject of the piers?—Mr. Clay and our Chairman, I think. I do not remember Mr. Robinson being present.

2374. Have you conducted the correspondence respecting these piers, or has Mr. Clayton?—Mr. Clayton has. I can put in plans.

2375. At the meeting of the Commissioners on the 18th of August last, there was a suggestion that Mr. Comrie should be employed to take soundings?—Yes.

2376. Did you give any instructions to Mr. Comrie, or who did?—Mr. Clayton gave him instructions to take them in the same line.

2377. You did not give any instructions?—I was present.

2378. Did you yourself give any instructions to Mr. Comrie different from or in addition to what Mr. Clayton gave him?—No.

2379. Had you anything to do with the reduction of those soundings, so as to present them upon that chart of Mr. Rendel's?—Nothing at all, it was altogether Mr. Comrie's doing.

2380. Do you remember on that occasion, the same 18th of August, that a committee was appointed to conduct the proceedings before this Commission, consisting of the Chairman, Mr. Rayne, and Mr. Allhusen?—Yes, there was a committee appointed.

2381. Did the instructions which have been given, as regards these observations, proceed, so far as you know, from any of those gentlemen?—It was my advice that immediately a survey should be got showing the river in its existing state. I pressed that upon them.

2382. On the same occasion, do you remember Mr. Allhusen giving a notice of motion that Parliamentary power should be applied for to obtain authority to apply the proceeds of land to the funds of the Commission?—I do not think that was on the same occasion.

2383. Assuming such a motion to have been made, would it have involved the necessity of compulsory powers to deal with the landowners?—Yes, I believe so; it might or might not have been compulsory.

2384. Do you not know that in the evidence before the Committee of the House of Commons, Mr. Rendel insisted that it was impossible to carry out any powers that might be properly called Conservancy powers, without compulsory power upon the landowners?—I do not know; I would rather not express an opinion.

2385. Is your opinion upon that question, that the landowners can be dealt with without compulsory powers?—I would rather not answer that question. It is more a legal question than an engineer's.

2386. You have given no advice to the old Conservators or the present upon that point?—I have not.

2387. You have produced three plans of Mr. Rendel's, I think. You have produced a chart of the river, with the soundings upon it, have you not?—Made for Mr. Rendel in 1849? I have.

2388. When did you first receive these?—We first received these plans when Mr. Rendel sent them with his report.

2389. When was that?—I forget the date; they were represented by the Town Clerk to the Commissioners.

2390. Have you had these in your possession ever since that time?—Except when they were in the possession of Mr. Comrie.

2391. Whose pencil marks are these upon the charts?—Those pencil marks are mine, made recently, tracing the contour lines, to put them upon a small plan. These lines, not the figures. There are pencil-marked figures, which, I believe, are Mr. Comrie's.

2392. Have you really used this chart of Mr. Rendel's for the purpose of tracing all these pencil lines upon it?—Certainly, I have; it is a chart of the Commissioners.

2393. I believe you have used it also for showing the moorings in Shields harbour, have you not?—I have, and I have made good use of it.

2394. Is not this an original document of the greatest value?—Yes, it is.

2395. Do you think it right that a document which cost the Conservators several thousands should be used in the way it has been?—I do think so.

2396. (*Captain Fitzroy.*) Is this the manuscript original, or a printed original?—A manuscript.

(*Captain Fitzroy.*) By Mr. Comrie?

(*Mr. Webster.*) By Mr. Rendel and Mr. Comrie, Sir.

2397. (*Captain Fitzroy.*) Has Mr. Rendel another copy of that document in his own possession, or is that the bonâ fide original?—I am not certain of that; I believe it is the original.

(*Mr. Webster.*) It is signed by Mr. Rendel.

(*Captain Fitzroy.*) He would sign a copy of the original in the same way, and give it in to the Corporation, and would keep the original, probably.

(*Mr. Webster.*) I understand this is the orignal; there is no other.

2398. (*To the Witness.*) I observe that you have laid down the moorings upon that?—I have stated so.

2399. Have you any other plan which shows the moorings except this one?—I have one or two plans showing the moorings also.

2400. Have you any other general plan showing the moorings, excepting such as you have pencilled down on this plan of Mr. Rendel's?—Yes; I have a tracing showing the moorings laid down.

2401. That tracing, I suppose, was taken from this?—No; the tracing was made previously; the moorings for North Shields were laid down on another plan first, and they have been transferred, in order to make this plan more valuable, to point out where the ships lie in the harbour at the present moment.

2402. Has this plan ever been shown to any of the Commissioners at any time since you got possession of it?—Frequently; all these plans.

2403. Can you mention any one of the Commissioners who has ever seen these plans?—I know they have been frequently brought before them all; they were delivered in by Mr. Rendel, and examined, and might have been inspected at any time.

2404. Are there not, besides this plan, documents containing tidal observations?—There are; I have put some of them in.

2405. Are there not also cross sections?—Yes.

2406. Did not Mr. Rendel accompany his report with an appendix of tidal observations?—He did.

2407. Where are those?—(*The Witness produced the same.*)

2408. Is this the only volume of tidal observations?—This is another; these are tidal observations showing the direction of the current.

2409. This is No. 2, I observe, where is No. 1?—No. 1, perhaps, would be a general plan; these are cross-sections again (*producing another document*), and showing his proposed river walls, and here is No. 10, calculations of when high water commences.

2410. Have you, or has Mr. Clayton, a list of these papers in the appendix to Mr. Rendel's report?—I believe Mr. Clayton has the list with the original report.

2411. Did you receive such as you have from Mr. Clayton?—Yes.

2412. You referred on Saturday to some tidal diagrams of your own which you were to produce, will you produce them now?—Yes; I produce them, but they are not complete. I have in my hand some tidal observations recently taken.

2413. They are not reduced?—They are not complete, they are not examined; they are not sufficiently advanced for me to be able to put them in.

2414. (*Mr. Armstrong.*) Are they taken by yourself?—Yes; at least under my directions. Mr. Comrie was too busy with his survey to be able to complete them in time.

2415. (*Mr. Webster.*) Excepting that tidal diagram, which was produced before the Committees of the Houses of Commons and Lords, in the Jarrow Dock Bill, and which was referred to on Saturday, have you any tidal diagram in a complete state?—I have some other tidal diagrams taken at an earlier date. This is in September 1848 (*producing the same*).

2416. You produced a tidal diagram on Saturday, which was the one that was produced before the Committees of the Houses of Commons and Lords, was it not?—I saw it on the table; I believe I did not produce it myself.

2417. I think you said on the occasion of that inquiry, it was a high-tide, and selected for showing the influence of the Jarrow Slake. "It shows where the influence of Jarrow "Slake would be more brought to bear upon the subject"?—Yes.

2418. You said that that tide was higher than an ordinary tide?—Yes.

2419. Have you yourself made from those observations of Mr. Rendel's any calculation as to the cubical capacity of the river?—No; it is all given in Mr. Rendel's calculations, which are delivered in.

2420. But you yourself have not made any calculations of the cubical capacity of the river of the kind to which Mr. Calver referred in his evidence?—No; it has been all done by Mr. Rendel, and he can give evidence upon that point; Mr. Rendel, or his assistants.

2421. Have you ever ascertained the quantity of tidal water that would be displaced by the projected works, for instance, the Jarrow Slake? have you ascertained the quantity of tidal water that will be displaced by Jarrow Slake, that is to say, yourself?—No; not myself.

(*Mr. Armstrong.*) Do you mean by "the works" the works sanctioned by the recent Act of Parliament?

(*Mr. Webster.*) Yes, Sir.

(*Mr. Brooks.*) I formed my conclusion, as engineer, that it was desirable to enclose Jarrow Slake, and I gave my reasons in a report. If the same body of water could be made to pass up another channel without prejudicing the main body of the channel, it would be valuable.

2422. I believe the principle upon which you went was this:—That by reason of Jarrow Slake being a sort of bulb from the main channel, it might be cut off in such a manner that the water from it would go to the upper part of the river?—It would enable a better column to be propagated much more readily up the river; I am not speaking as to the quantity.

(*Mr. Webster.*) That is all I have to ask Mr. Brooks, Sir. I do not know what course is to be pursued with these valuable documents of Mr. Rendel's and Mr. Comrie's; it is

W. A. Brooks, Esq.

29th January 1855.

perfectly impossible, at the present stage of the Inquiry, that I can make any use of them, and what I would suggest to you, or perhaps to Mr. Brunel, would be, whether somebody in conjunction with Mr. Brooks should not examine certain sections for the purpose of ascertaining the capacity of the river at those places.

(*Mr. Seymour.*) I should throw no difficulty in the way of that.

(*Mr. Armstrong.*) At present I think our best plan would be for the re-examination to go on.

(*Mr. Webster.*) I merely reserve my right to ask any question upon that at the proper time; and of course, Sir, I am not at present in a condition to ask any question upon the piers, as the correspondence is not produced.

Re-examined by Mr. Seymour.

2423. You have been asked a great many questions with reference to your deviation or supposed deviation from Mr. Rennie's line; will you attend to the following passage in Mr. Rennie's report:—"The lines of contraction laid down by me are not, however, "regular; they are always wider where the turns are, and in general the river has been laid "out of a greater width where the greatest number of vessels generally lie, in order that "proper room may be afforded for others to pass and repass them; and as vessels which lie "in the river to take on board cargoes not only occupy considerable space, but also occasion "eddies, there is more space required for the tide water to pass them than in places where "vessels do not generally lie. It is possible, however, that experince may prove that these "spaces should be still further contracted."—I remember that passage.

2424. I will call your attention to another passage:—"I have laid down the line of the "channel, which I would recommend to be adopted, and also the situation of the jetties, "which appear to me to be the best. But it is by no means unlikely that in the course of "executing the work, it may be found convenient to alter the places of several of the "jetties, to render them more suitable to the coal staiths on the sides of the river, several of "which will require to be altered, and this will be attended with considerable expense."—I remember also that passage, which affects the question materially.

2425. In any deviations which you have made, have you, as far as practicable, and for the interests of commerce and the trade upon the river, pursued the principle of the lines laid down by Mr. Rennie?—I have, to the best of my ability.

2426. For instance, upon the question of White Hill Point, in point of fact is not half the coal shipped upon the Tyne, shipped at South Shields?—A very great portion, indeed; I should think about half; about one-third part, I am told by a party better acquainted with it than myself.

2427. I think you have already told us that the effect of your having followed the cutting off White Hill Point would have been to destroy the works at South Shields?—It would have been of a ruinous nature; it would have put a stop to the working of the collieries, and have inflicted immense damage.

2428. Some questions were asked you on Saturday with reference to the prudence of beginning the works at the bar, or higher up the river; do you recollect the following passage in Mr. Rennie's report? "The works that strike me as most material to be done "first, are those which tend to direct the river in a straight, or at least an uniform course, "where it is most interrupted by sand-banks." Has that been an object which you have had in view in following out Mr. Rennie's suggestions?—It has.

2429. You have been also asked questions with regard to the prudence of doing the works as a whole, and as simultaneously as possible. Has your attention been called to the following passage? "Where the channel of the river is to be materially changed, it "should be done gradually; for if it were done otherwise the sudden effect produced would "greatly impede the navigation."—I have attended to that in my practice, as it is a sound observation of Mr. Rennie's.

2430. You are not aware that you have departed, in principle, from those views of Mr. Rennie?—I am not aware that I have at all; I believe the contrary; I have adhered to them as closely as I could.

2431. Mr. Rennie states: "I have to remark that the river throughout, I mean the "contracted channel, will be very much deepened, and consequently the low water will "be depressed in its surface; and as the flood-tide will be much less obstructed, it will "flow farther up the Tyne, and rise higher than it now does." Can you tell me whether there is any depression of the low-water depth higher up the Tyne?—There is; the water ebbs out to a lower level now than formerly.

2432. (*Mr. Webster.*) That will be proved by the tidal observations?—That will be proved by the tidal observations.

(*Mr. Webster.*) Those Mr. Brooks has not got, Sir.

2433. (*Mr. Brunel.*) Have you put in anything which does show it?—No.

(*Mr. Webster.*) It was with reference to this that I asked Mr. Brooks some of the questions which perhaps some of the Royal Commissioners might have thought irrelevant. Up to a certain date he said he had made no observations.

2434. (*Mr. Seymour.*) You will, I believe, put some in?—I will.

2435. I will call your attention to this passage: "The mode of contracting the river "where required, I propose to be the same as that practised in the River Clyde, which, "with the addition to the plan suggested by me about eight or ten years ago, has proved "so very successful, namely, by building jetties from each shore, and moving the sand and

" gravel out of the intended channel, by means of dredges, and depositing it in the spaces " between the jetties, and when the channel was brought near to the depth it was expected " the water would maintain, these jetties have been joined by walls of rubble stone, " whereby the channel has been preserved of a regular depth." Will you state whether in the practice pursued in the Clyde, the jetties were half-tide jetties or full-tide jetties?—I know that full-tide jetties were adopted.

2436. Were not half-tide walls adopted?—Yes; and those half-tide walls were afterwards raised to full-tide walls. I made a report upon the subject to the Tees Navigation Company, in September 1833; in that year I was sent by the Tees Navigation Company to the Clyde, and made tracings of all the plans of the Clyde, and copied their reports, and gave them to the Tees Navigation Company, and I wrote a report upon the same.

2437. Can you tell me whether the works upon the Clyde commenced from the head of the river downwards, or from the mouth of the river upwards?—From Glasgow downwards.

2438. You have just referred to the Tees Navigation Company; I understood you the other day to say that you recommended the same principle as you have been carrying out upon the Tyne, to the Conservators of the Tees?—Yes; I laid out works there very extensively.

2439. Are the Conservators of the Tees interested in the land?—Not at all, with the exception of where they have made a purchase of land to make a cut to alter the course of the navigation; they bought enough land to make the cut, and that is all.

2440. Therefore you were altogether independent of any question of interest to which my learned friend has alluded, and you recommended the same plan?—Certainly.

2441. Did the works at the Tees commence at the head of the river, or the contrary?—They commenced at Stockton, and went downwards. I have said before, that a work the other way would involve a very much larger outlay, and would not be so practically useful.

2442. There have been a great many questions with reference to Mr. Rendel. Mr. Rendel was examined, we understand, on the Tyne Conservancy Bill on the 5th of June 1849; did Mr. Rendel then give the following opinion with reference to your proposed deviations? " Generally speaking, I have not the slightest grounds for objecting to Mr. Brooks' lines; " but there may be some cases in which, if the thing has to be gone over again, you would " suggest some alteration; but I think they would be very trivial."—Mr. Rendel made that observation.

2443. Do you remember whether Sir William Cubitt was examined upon the same occasion?—He was.

2444. Do you recollect the following question being put to Sir William Cubitt? " Supposing the expense necessary for the carrying out of Mr. Rennie's line to be gone to, do " you think the result would be anything like worth the money?" " I think not. I think " the river may be made quite equal, in point of depth and capacity, as was laid down in " Mr. Rennie's plan, at much less cost than by adhering to his lines. I again say, his " lines represent the principle of improvement; that has not been departed from, and need " not be, I think." Was that opinion of Sir William Cubitt's given with reference to the questions as to the prudence of your deviations from Rennie's lines?—It was; and when Sir William Cubitt was asked upon all the material variations made by me, in every instance he stated that my deviations were decided improvements; he gave his reasons too; they effected the same object with much less expense.

2445. You have been asked a good deal about Mr. Rennie's works at Willington Quay; what was the effect of those works generally?—To throw the Corporation into great difficulties; the attempt to carry out Mr. Rennie's plan at Willington produced all the injurious effects which I have previously stated; perhaps I have said enough upon this point; the Commissioners will understand the alterations.

2446. Was the result of your deviation to counteract the mischief produced by the carrying out of Rennie's works?—It was, but not effectually; they have not yet the deep water which they had previously. I have assumed the Tyne to be a dead level; practically, that generally is correct; but at times we find a depression of about 3 inches at Newcastle, and then above bridge there is a rise takes place. It is first felt about Elswick, where the fresh water comes into operation more effectually on account of the channel getting narrower. As you get higher up the river, there is a rise of about 8 inches above the true level of the sea, but that rise, I believe, is altogether due to the greater influence of the fresh water in a narrow channel.

2447. You have been asked about the ground of Messrs. Palmer, and you have alluded to the visit of the Commissioners to the ground; was Mr. Straker present upon that occasion?—He was.

2448. Were Mr. Stevenson and Captain Purdo also present?—They were also present, I believe.

(*Mr. Webster.*) My learned friend the Recorder, Sir, has asked a question about the Clyde, which is new matter, and therefore I propose that you should ask one question only upon that.

(*Chairman.*) Certainly.

2449. (*Mr. Webster.*) Is not the object on the Clyde to make the flood waters maintain a deep still-water canal up to Glasgow?—No, it is not.

2450. In your opinion, as an engineer, having reference to the different character of rivers and estuaries, is there any comparison between the Clyde and the Tyne?—I consider

W. A. Brooks, Esq.
29th January 1855.

that there is, as regards the works, particularly, for improving navigation. The object was not to make a still-water navigation up to Glasgow; that would have involved the making of a canal.

(*Mr Webster.*) Sir, my learned friend the Recorder has asked several questions about the opinions of Sir William Cubitt and engineers; there are abundance of passages quite of a contrary character. Now, Sir, as regards this important question about these plans and sections, there is an immense mass of documents, and the minority of the Commissioners only want to have the matter properly ascertained; and therefore, as my learned friend the Recorder said he would concur in any plan for ascertaining what really were the results of those elaborate observations of Mr. Rendel as compared with the elaborate and repeated observations of Mr. Comrie, and the general results of the two as regards Mr. Rennie, of the same kind Mr. Calver spoke to as regards the capacity of the river, I am quite at liberty to mention that matter.

(*Chairman.*) We have been already discussing this point, and we will endeavour to fix upon some plan by which all these various documents may be compared, and the result brought before us.

(*Mr. Webster.*) This question, by the examination of engineers as to the present state of the Tyne, may go on for ever, but I think there are sufficient documents. Perhaps my learned friend might think it expedient to call pilots and practical people to show this and that. I admit that the channel up to Newcastle is in some respects better, but this is a matter really resting upon tidal observations, strictly engineering, so to speak.

(*Chairman.*) We shall endeavour to ascertain the fact as to the present and former state of the Tyne as correctly as we can; we shall probably do so by these documents upon the matters of fact, and by the testimony of experienced persons.

(*Captain Fitzroy.*) At all events, Sir, I think, as a member of the Commission, I may be permitted to remark that the Commission will take their own course in these matters, and not be dictated to by the counsel on either side.

(*Mr. Webster.*) I hope you do not feel that, Sir.

(*Captain Fitzroy.*) I feel it so.

(*Mr. Webster.*) I am sure, Sir, it must have been from your not having had so much experience as other gentlemen.

(*Chairman.*) That observation did not come from the chair.

(*Captain Fitzroy.*) No, it came from me; it is my impression; and therefore, as a member of the Commission, I expressed my impression, which I had a right to do.

(*Mr. Armstrong.*) I am quite sure the learned counsel will disavow any such motive or any such intention at all.

(*Captain Fitzroy.*) It is the impression on my mind that there is too great an endeavour upon one side to direct the Commission in their proceedings, as to which, of course, it is for the Commission to decide.

(*Mr. Brooks.*) May I be allowed to state that a great many questions were put to me with regard to soundings upon Hebburn Shoal. I have omitted to put in those different soundings taken by myself at different stages of the work as it went on. I produce them all now; they are interesting professionally, at all events.

2451. (*Mr. Webster.*) Reduced to Rennie's level?—Yes; all reduced to Rennie's datum.

2452. (*Captain Fitzroy.*) We find that there have been the most valuable and important plans of the river Tyne, and records of the various measurements, made in the most careful manner, in the years 1813 and 1849, by three distinct parties, Mr. Giles, Mr. Comrie, and Mr. Calver; why is it that these records and their comparisons have been produced so tardily, I may say at so late a period, instead of being furnished in the first instance for general information?—I was ready to produce them at any time when called upon.

2453. They have been accessible to parties interested at any former time?—At any former time, always, certainly.

2454. It is said in the 33d clause of the Conservancy Act—an Act for the improvement and regulation of the River Tyne, 1850, "And be it enacted, that the Commissioners "shall, with all convenient speed, cause to be made a map of the area within the limits of "this Act, and of any adjoining parts which they think it expedient for any of the purposes "of this Act to include in such map, on a scale of not less than six inches to a mile, and "with such indications of shoals, banks, levels of high and low water, quays, wharves, "works, and other particulars, as they think expedient for any of those purposes, or for "the general advantage of persons resorting to the port, or contributing to the income of "the Commissioners, and shall cause such map to be from time to time copied, engraved, "and published, as they think proper, and shall from time to time cause such map to be "revised, and such additions and alterations to be made in and to the same as may be "requisite, and the date of every such revision shall be expressed thereon; and every map "so made shall be kept in the chief office for the time being in Newcastle-upon-Tyne of the "Commissioners, and the same, or a copy thereof, shall, at all seasonable times, be open to "the inspection of all persons interested in the navigation of the port, and the owners and "occupiers of all lands fronting the tidal waters within the port. Provided always, that the "charge for any one published copy of the map shall not exceed one shilling." I ask you whether that section of the Act of Parliament has been complied with?—It has not; I believe principally upon the ground of the great cost of supplying such a map at so small a price as one shilling. A map of a river seventeen miles long, six inches to a mile, would be a

very expensive work to produce at the price of one shilling. I believe there was a general opinion among the Commissioners that it really was not required.

2455. Can you explain to me the reason why, with such a mine of knowledge in existance respecting the Tyne, so little practical accessible information is at the present moment before the public?—It is really accessible. It would not do to allow every stranger to come in from curiosity to examine the documents; if that were the case, they would soon be destroyed.

2456. But it appears that the intention of those who drew up this Act of Parliament was, that the Commissioners should be at the expense of compiling and publishing such documents, upon the scale of 6 inches to a mile, and that the public generally should be enabled to obtain them at the simple, you may say nominal, cost of 1*s.* each?—Yes; it has not been done: that is all the reply which I can make to it; but there have been no complaints of its not having been done. I have had no application from any person for any map of the kind ever since the Act was passed.

2457. (*Mr. Webster.*) You do not assert that in the presence of Captain Purdo, surely?—I do say so. If Captain Purdo had brought a motion forward, the matter would have been discussed.

2458. (*Mr. Brunel.*) Have you the expense of dredging of the previous years?—The expenditure in dredging has been mainly, for many years back, in keeping open the coal staiths on each side of the river. There has been very little dredging indeed in the main channel; the dredging in the main channel has been the exception. I shall be able to place before this Commission a calculation of the number of cubic yards of material that has been displaced, as comparing the state of the river in Rennie's time and at the present moment, between the lines now occupied by the works. I have drawn lines upon a plan, and I am getting out the difference of the cubical contents.

2459. Pursuing some questions which Captain Fitzroy has put to you, with respect to plans accessible by the public, as regards the plan which you delivered in as showing the river lines proposed by you in 1843, was that plan, as then delivered in, in the same state that it is now; that is to say, were those lines which are in ink, purporting to give your river lines as compared with those of Mr. Rennie, then drawn in ink as they are now?—They were. Mr. Rennie's lines and my lines are there.

2460. Generally speaking, those lines on that plan have not been altered since?—No.

2461. There have been no erasures?—No.

2462. And you believe that they are as they were then?—Certainly so; I am sure they are.

2463. And that plan has been produced upon public occasions, so that there can be no mistake about it?—It has; there can be no mistake about it at all.

2464. On what sort of occasions?—It was produced before Captain Washington; it has been produced upon almost every inquiry with reference to the Tyne.

2465. That identical plan?—That identical plan has been produced, and at the inquiries held in London, I have there stated that I had produced that plan before Captain Washington.

2466. And that plan has been kept at the office of the Commissioners?—Yes.

2467. And has been produced before them from time to time?—This old plan has not been often used. There has been a fresh plan used, generally speaking.

2468. That identical plan of which we were speaking just now, has not generally been produced before the Commissioners, but has been introduced upon many public occasions, so that it could be identified?—Yes.

2469. What other plan have you generally used and produced on conversation or discussion with the Commissioners?—The plan which the learned Counsel has in his hand at the present moment.

2470. This plan was only made, I think, in 1849?—It was made about that date.

2471. It bears the title "Plan of the Improvements made in the River Tyne under the "direction of the Corporation of Newcastle-upon-Tyne; and of those recommended to the "Tyne Improvement Commissioners, by W. A. Brooks, 1851." Then, between 1843 and 1851, what plan generally was used?—The plan which I have previously referred to, which was laid before Captain Washington.

2472. This consists of the sheets of Mr. Rendel's engraved plan mounted together and formed into a general plan?—It does.

2473. Were the river lines laid upon this at that time, in 1851?—They were.

2474. Did they deviate much from the river lines of the plan of 1843?—They deviated very little.

2475. Has that plan been in the possession of the Commissioners, and has it been produced on public occasions at their meetings, or otherwise?—At almost every meeting. I have made a practice of invariably taking it down there; and it was used on all the river views. It was spread out upon the table and examined.

2476. Those river lines, then, we may consider as being the lines which you have long matured, whether they agree or not with Mr. Rennie's, and which you have considered as, practically speaking, settled; and they have been so introduced before the public, to a certain extent, in the way which you have mentioned?—Yes; they have been used for that purpose, and they have been referred to when parties have made their application for licences. The question has been frequently put to me, "How far do they agree with your "lines?" and I have given my opinion.

W. A. Brooks, Esq.

29th January 1855.

2477. And those lines upon that engraved plan show the river lines which the Commissioners may assume are what you now propose shall be adhered to?—They do.

2478. With any exceptions?—The only exception is the arrangements of the lines for the two docks. I will put in the Admiralty plan, showing the line fixed upon for the Northumberland Dock (*producing the same*). There are three lines laid down upon the plan.

2479. Then is this line, as settled by the Admiralty for the Hay Hole Dock, the line now shown upon the engraved plan in blue?—No; it is very nearly upon that line. It is shown upon some large detailed working drawings, which we have got. This plan has not been used for that purpose.

2480. Then it is not exactly this blue line?—No.

2481. Is it near it?—Very near it, indeed.

2482. Then what is the blue line?—The blue line is a line which I had previously drawn for the dock. Mr. Rendel had drawn a straight line.

(*Mr. Brunel.*) Then on this plan, which you usually produced before the Commissioners, it was rather singular to introduce upon it a line which you proposed, and not the line which had been determined upon; however, so it is, you say——

(*Mr. Webster.*) There are three distinct lines there.

2483. (*Mr. Brunel.*) Then the introduction of a modified line for the Hay Hole Dock, as determined by the Admiralty, would involve altered lines on the south side?—It would.

2484. Are those shown yet on this general plan?—No, they are not, because I am waiting for it to be fixed by the Admiralty.

2485. Then the Admiralty have also to fix the line of frontage for a portion of the Jarrow Slake?—I believe they have already done it, but I have not got it in my possession.

2486. Does this line, which is laid down again in 1851 upon this standard plan of the Commissioners, show a cutting off of White Hill Point?—It does.

2487. The same as before?—The same as before, or nearly so.

2488. Will you explain to me a little difficult question about White Hill Point? Nearly all the lines projected by you, show a cutting off of White Hill Point?—Yes.

2489. What sort of building is on White Hill Point?—There are several coal staiths.

2490. To whom do they belong?—The lessees under the Duke of Northumberland.

2491. Is there any reason as regards the very great value of property, why it should not be cut off?—No, not the value of property at that point; but there is a reason as regards the value of the property in Shields Harbour.

2492. As your general line of river wall there is in every case carried through White Hill Point, and as Mr. Rennie carried his also through White Hill Point, as nearly as possible in the same direction, why does that form an exception to the general rule in laying down such lines in a river? why should you have a projecting point there?—Simply because I believe the effect of White Hill Point is to throw the current of the ebb upon the south shore; that is to say, through Shields harbour, and to produce deeper water there than would be the case if White Hill Point were cut off. If you cut off White Hill Point it would diminish the depth in South Shields harbour.

2493. Would not that object have been better and more materially effected by a trending of the general river line to White Hill Point, and then off again, if you wished for such an effect?—That would be advancing the quays on the south side.

2494. On the north side, by trending a pair of river lines from the Hay Hill Point to the White Hill Point, and thus giving a direction?—I do not believe we could do it.

2495. If the projection of White Hill Point, as you think, is desirable for the purpose of sending the current over to the south side, and thus, I suppose, leaving the tiers on the north side more quiet, would not that effect be naturally produced, as you have endeavoured to do at every encroachment in the river, by leading the river line fairly from Hay Hill Point to White Hill Point, and then off again in any other direction which you wish?—That might be done.

2496. Why does White Hill Point form an exception to every other part of the river which you cut off, such as Bill Point, or any other point, which formerly struck out and interfered with the line of the river?—Simply on account of the existing interests in South Shields, the great loss of berthage which would ensue. If I could have provided docks sufficiently to supply the water, then I would have cut off White Hill Point.

2497. Then, as an engineer, am I to understand that in order to direct the current from Hay Hill Point across to South Shields with the least possible general interruption to the velocity of the water, your idea of the best way would be to keep the river line back to where you have drawn it, and leave a groin sticking out like White Hill Point?—No. I think it would be best, in that case, to draw a line from Hay Hill Point to White Hill Point, provided you had no alternative at a future time of cutting off the point itself.

2498. Then you think it would be desirable to leave White Hill Point as a temporary projection to drive the water over to South Shields, but with the prospect hereafter of cutting it off, and making a fair line of the river?—That is exactly my opinion.

2499. Has that ever been explained before to any body?—It has. I have always explained, as an engineer, that my object would be to cut it off, but that I dared not do it under the existing circumstances of the trade of the port, without providing dock accommodation.

2500. Are others interested in the trade of North Shields of the same opinion, that that

point protects the berthing of their vessels much?—I do not know that; the South Shields people would cry out.

2501. Was the object of leaving White Hill Point to deepen the water on the South Shields side, or was it, as I understood you before, to protect the harbour on the north side?—It has deepened the harbour on the south side.

2502. What is the object of leaving it?—To have more ships lying on the south side of Shields harbour; we have not room as it is now for the number of shipping requiring it. Frequently notices have been sent up to the parties who have the management of the ships at the different staiths, desiring them not to send down any more ships to Shields harbour, as the harbour was so crowded that it could not hold them.

2503. Then the object is to scour out a deeper harbour at South Shields, and have more berthage room?—It is.

2504. And there is no other reason, really and truly, for preserving White Hill Point?—No. There is a great quantity of coals shipped; it has been stated already that one-third of the entire quantity of coal is shipped on the South Shields side, and that is the great reason, of course.

2505. As regards the principle of the works which are now in progress throughout the river, do I understand you correctly that the principle which you are now following, at all events, is that of contracting the river to a channel, generally speaking, in the direction of what we may call the river lines, and to do that by means of projecting groins at right angles, forming solid ground from the present high-water mark up to the river lines?—It is; solid ground travelling in a quay from one end of the river to the other, eventually.

2506. Has that always been the principle which has been proposed from 1843?—It always has, except the dock.

2507. And has it been publicly avowed and publicly stated on occasions which prove it?—Frequently; it was always stated that the effect of those works would be to eventually convert the spaces between the groins, or where the walls are made, whether half tide or full, into solid land. It was a mere question of time how soon the spaces so enclosed would become land.

2508. The removal of some of the projecting points, such as Bill Point, would form part of that system?—Yes.

2509. And that has been the systematic intention since 1843, at all events?—Yes, expressed very strongly by me.

2510. And carried out by you, under the orders of the Commissioners, in that way?—It has been. The deposit of ballast was all carried to the level of high water; in many parts of the river ballast works were going on, and they were all raised to the level of high water, or 3 feet above high water.

2511. In endeavouring to make that solid land, have you considered that it would be actually better for the river that it should be high and dry, or that, taking into consideration the value of the property so reclaimed, it was more desirable to do it?—My opinion has been solely given, with reference to the increased value, to the navigation.

2512. That the navigation would be better in that confined channel without the tidal water, which on each tide would be received over the sloping shores, than with it?—That is my opinion. I believe it would be better to concentrate the power of the water more effectually upon a given channel between high-water walls.

2513. Have you calculated the quantity of water that would thus be abstracted from the total amount of tidal water, in forming that opinion?—I have not gone into that. I look upon the Tyne as a river, more as a fresh-water navigation; the freshes are the governing power in the Tyne. We find that in the Tyne, the freshes, when they are coming down, run continuously for the whole period of the flood tide; the tide does not make up; even in Shields harbour it is so very often. In a great portion of the river they run down during the entire time of the flood tide.

2514. How many times in the year, speaking roughly, will such a phenomenon occur?—Not very often; only during heavy floods.

2515. Give me an idea?—I do not think more than 4 or 5 where they run completely down.

2516. The Counsel suggests that that running down might be the fresh water running over the salt water of the flood-tide; have you ascertained that fact at all, that that is only a superficial current?—It runs so strong, that it is quite impossible that the tidal wave could run up in the part which I am alluding to. When it is running at the rate of 4 knots an hour, which I believe to be certainly the velocity, I believe that that is impracticable.

2517. Have you any data to furnish to the Commission? This is quite new, that this is to be looked upon as a fresh-water stream running into the sea?—Not a fresh-water stream altogether; the two powers are united.

2518. It being, I think, new to the Commission, and certainly quite new to me, that we ought to look upon this river as mainly or even greatly influenced by the fresh water streams, it will be very essential that we should have some facts and some data which would enable us to judge whether it is so or not. Nothing whatever that has been presented to the Commission yet would lead them to that opinion, and therefore I should wish to know whether you can give me now any data whatever as to the quantity of fresh water which comes down?—On Mr. Calver's plan, which has been laid before this Commission, there is a statement as to the discharge of the freshes during a land flood, as observed

W. A. Brooks, Esq.
29th January 1855.

by him at Newcastle. It shows that during the entire duration of the tide, both ebb and flood, the water only fell six inches at Newcastle, and ran down continuously; it stood at 14 feet 6, or 6 inches below the datum tide at high water, and 14 feet at low water; that is a fall of only six inches.

2519. That was some extraordinary flood?—It does not appear to have been a very extraordinary flood, because the flood only rose to the level at Newcastle of 6 inches below the datum tide; a heavy tide would be above that.

2520. Are we to understand that it is not a very unfrequent occurrence that the water remains at Newcastle Bridge within a foot or two of the high-water level?—I think I should correct my answer, and say, there are six or seven times in the year, at least, when we have that level; we have a very strong tide running down. Another gentleman, who has given his attention more particularly to this matter, and has recorded his opinions, Mr. Thomas John Taylor, has given the amount of fresh water.

2521. Are not you, as the engineer to the Commissioners, possessed of facts which have enabled you to form an opinion which must influence so immensely all the proceedings below Newcastle?—Yes; I have observed these facts as to the great power of the discharge of the freshes; I have observed them also in Shields harbour.

2522. And you consider that the works of the river below Newcastle should be constructed rather with reference to the effects of the freshes than with reference to the effects of the tidal waters?—They must be both conjoined; I consider that the tidal element must be also brought into consideration.

2523. Which has the preponderance?—I think the fresh water has the preponderance.

2524. Actually a preponderance over the tidal water?—I think so, as regards its influence in keeping open the channel.

2525. At all events you think they are nearly equal?—I think the fresh water has the governing influence in keeping open our deep channels.

2526. Then it is at least equal to the tidal water?—During its power.

2527. We must take, of course, the average of the year; do you think that the general effects throughout the year upon the channel of the river are rather produced by the fresh water than by the tidal water?—The general effects must be more produced by the tide, if you take an average.

2528. Whether the effect is produced by two days out of ten, or by eight days out of ten, it is the general effect?—The general result is greater, as produced by the heavy freshes.

2529. Then you think that the general effect upon the bed of the river is produced more by the freshes than by the tidal waters?—I think so.

2530. What are the data upon which you have formed that opinion, because, as I say, it is an opinion which influences the whole character of the works below Newcastle?—Observing the great effect produced by heavy floods upon the channel of the river——

2531. Do you mean merely by a general impression?—Observation of the river in the heavy floods in driving away the sand banks, which, during months of the year, or when the tide is running very strong, remain precisely in the same state. During the strongest equinoctial springs, I have seen no change take place generally in the sands of the river.

2532. (*Mr. Armstrong.*) But you have observed it after a fresh?—Yes; then I have seen a strong influence produced upon them; but during the strongest tide, say an equinoctial spring tide, with no fresh in the river, even in the lower part of the river, above Shields harbour, the sands remain just in the same state, and I do not notice any change in them.

2533. (*Mr. Brunel.*) Do you think that that applies to the whole course of the river, or nearly so, from Newcastle to Shields?—I think it does as far as Shields, as far as Hay Hole Dock at all events.

2534. I understand you that from your observation now of ten or twelve years, you think that the bed of the river remains tolerably unaffected by the tidal water, but that as soon as freshes come, it is deepened?—That is my opinion.

2535. What are the circumstances, as far as your observation goes, which are associated with the filling up again of that deepening after a fresh. Is it immediate, or how is it?—The flood tide brings a great quantity of sand into the harbour.

2536. Are you sure of that? How do you know it comes from the sea?—I know that a great deal is brought in.

2537. How do you know it?—From seeing the effects produced by the flood tide upon the sand at the mouth of the harbour. The sands in the bed of the river are all alive on the flood tide.

2538. Where does that sand come from originally? Is it brought down by a fresh?—I believe it is principally marine sand in the lower part of the river.

2539. Have you taken any means whatever to ascertain whether that sand is the sand brought down by the freshes, or whether it is sand brought from the coast?—I have compared it, and it appears to be the same sand as the sand which we find on our own sea shores.

2540. But you have not taken any particular means to ascertain the fact?—None, but a close inspection; that is not a considerable degree up the river.

2541. Do you mean microscopically, or how?—I cannot say that I have used the microscope.

(*Mr. Webster.*) Will you allow me, Sir, to refer you to a passage in a report of Mr. Brooks of 1845 (*handing the same to Mr. Brunel*).

W. A. Brooks, Esq.
29th January 1855.

(*Mr. Brunel.*) "The power of the ebb to return to sea the sand brought in by the flood "is greater than the power of the latter to accumulate it within the river. Hence, the "main channel is always to be found in the direction of the strength of the ebb. Some "persons imagine that the power of the flood tide to move sands is greater than that of the "ebb, because they observe some sands which, alive on the flood tide, are found hard on "the ebb tide. But they do not carry their observation a little further, which, if they did, "would compel them to conclude that the cause of the firmness during the ebb is, that "these sands happen to be out of the direction which the current of the ebb takes, and are "solely exposed to the strength of the flood tides. Such as Droitwich Sands and the Herd "Sand, which are all hard on the ebb, and alive on the flood." That agrees perfectly.

(*Mr. Brooks.*) That agrees with what I have stated I have been informed by parties who have bathed upon the Herd Sand that the sand there comes in so sharply by the action of the current that they can feel it.

2542. (*Mr. Armstrong.*) They can feel the impact of it?—They can feel the friction of the sand upon their legs. I can easily point out upon the plan the deep channel made by the flood tide.

2543. (*Captain Fitzroy.*) With reference to the important question asked just now, as to the relative powers of the ebbing and the flowing water, is it a fact that the bar rises or becomes more silted up after a succession of dry weather, when comparatively little fresh water has been brought down the river for some time, and the bar has been exposed during that time to the action of the sea only? Is it or is it not a fact that the bar becomes worse?—I believe it becomes worse.

2544. After the bar has been what is called worse, worse than the marks as it is called, for a considerable time, upon the occurrence or immediately after the occurrence of heavy freshes from the interior, is the result a scouring of the bar and an improvement of the bar? is the bar better after heavy freshes from the interior?—It is better after heavy freshes.

2545. Although occurring very rarely, there are such instances as the following:—In 1752, "The River Tyne was swollen to a prodigious height by a thaw, when by the "impetuosity of the current and the violence of the river all the ships in the harbour at "Newcastle were driven from their moorings. Two of the largest stones on the quay, "in which mooring rings were fixed, were torn up, and much other damage done." Then again in 1771, "About 2 o'clock in the morning the inhabitants of Newcastle were "alarmed with the most dreadful inundation that ever befel that part of the country, the "water of the Tyne rising 6 feet higher than the remarkable fresh in 1763," which is not mentioned in this book; "the first dawn of day discovered a scene of horror and devas- "tation too dreadful for words to express. All the cellars, warehouses, shops, and lower "apartments of the dwelling-houses from the west end of the Close to near Ouseburn were "totally under water. The flood was so rapid and sudden that it was with the greatest "difficulty the inhabitants who slept in the lower parts of their houses escaped with their "lives. The middle arch of Tyne bridge, and two other arches near to Gateshead, were "carried away, and seven houses with shops standing thereon, together with some of the "inhabitants, were overwhelmed in immediate destruction. The Land Hill was a capacious "flood, boats plying thereon for some hours; in some parts it was 6 feet deep. All the "timber, merchants' goods, &c., lying upon the quay, and a number of keels, boats, and "other small craft, both above and below bridge, were carried down by the rapid current "and scattered and stranded on each side of the river to Shields, or otherwise borne "onward to the sea, and there sunk or wrecked along the coast. Three sloops and a brig "were driven upon the quay, and left there when the flood abated; they furrowed up the "pavement and broke down a great part of the quay. By the violence of this flood several "ships were driven from their moorings at Shields upon the Herd Sand; some of them "were lost." Then in 1782 there was a great fall of snow, and next morning a very heavy rain with a strong wind, the Tyne was raised higher than was in remembrance, except the flood of 1771. Upwards of fifty light colliers lying under Tynemouth Castle were obliged to cut away or slip their anchors and drive out to sea. There are many other instances given of heavy freshes, but I refer to those two or three for the purpose of asking whether you consider that such occasional powerful effects of water have any material influence in forming, and from time to time altering, the channel of the Tyne as compared with the constant effect of the ebbing tide?—I am quite satisfied that that effect is produced upon the sands very much greater than by any tide, even the highest equinoctial tides. I have myself visited the quays of Newcastle when flooded, and the water in the cellars.

2546. Was the channel of the river Tyne, in your opinion, originally formed by fresh water escaping to the sea, or was it formed by the tide of the sea in the first instance?—I believe that the great bed must have been originally due to some great convulsion of nature, and that it subsequently filled up with marine sand, and partly with the material from above.

2547. Then is it your opinion that rivers generally are formed by convulsions of nature or by the tendency of water flowing off a tract of land to run off by the lowest level, and gradually to scoop out a channel?—That effect will be produced, but the great feature, I believe, in the formation of all these rivers is from these great geological phenomena. I do not believe it possible that any flood tide could have the effect of making out a channel for a river; it certainly must be due to the back water, or rather the tendency of the flood tide would be to bring material into the river. The fresh water in the Tyne acts

W. A. Brooks, Esq.

29th January 1855.

very much more energetically than the tidal water. Whenever a fresh comes down the river, there is always great alarm in Shields Harbour as to the damage from the fresh, and the harbour-master gives instructions to extra-moor the ships, to secure them to the shore in addition to their moorings.

2548. (*Mr. Brunel.*) Do not you know of tidal estuaries and bays in the sea, the mouths of which are kept clear solely by the flow and reflow of the tide?—No doubt of it.

2549. I understood you to say, which I thought weakened the more valuable part of your previous evidence, that you assumed that the tide could not keep open a channel, that it must of necessity bring the sand in and fill it?—It depends upon the form.

2550. That is the danger of generalizing?—Yes; it depends upon the form of the bay.

2551. As to the effects of freshes upon this particular river, how long after a fresh has scoured out the river is it before the river comes back again to the state which it maintains till the next fresh comes?—I can illustrate this by an example which is in my own memory, with regard to the alteration effected near Newcastle, in one of the heavy freshes. On the convex shore, at Gateshead, there was a mud and sand bank of considerable extent; it extended over towards the north, and when a fresh came down it was carried out almost like a wall.

2552. We will assume that after a fresh the river is generally improved?—Yes.

2553. How long is it after the river has been so deepened, after a violent fresh, before it again returns to its ordinary state, and then is kept moving backwards and forwards by the mere daily effects of the tide?—I cannot give a precise answer to that question.

2554. Is it long?—It is, I consider.

2555. Is the river generally improved from top to bottom, as far as regards the navigation, by the effect of a great fresh?—It is.

2556. Does that improvement last for a fortnight?—Yes; very much longer.

2557. Does it last for a month?—I should say at least a month.

2558. Is it a well-known fact in the Tyne, that the depth of channel and the general powers of navigation of the river are materially improved by a great fresh, and that that improvement lasts for a month?—It does; it lasts for a considerable time; an improvement is always felt where the current of the ebb takes a true course.

2559. And is that a well-known fact?—It is.

2560. Do you think that most independent parties would express the same opinion?—I believe every man accustomed to navigate the river, a steam-boat master or pilot, would state, that after the freshes we have a greater depth of channel.

2561. And that they feel the benefit of it for a month?—They feel the benefit for a considerable time afterwards.

2562. A fortnight, three weeks, or a month?—Longer than that. You find the river better during the winter time than in the summer; during all the winter months you find a much better navigation, excepting some points where the current of the ebb has a bad direction, or a direction not fitted to act upon the sand at that spot. Of course I am aware of the value of tidal water, and look upon my works as tending to produce a greater depth of tidal column in the channel than could possibly exist in the river if allowed to wander from side to side. It must be remembered that that tidal water comes in at every tide, being produced by the depression of the low-water surface.

2563. Considering the great importance which you attach also to the amount of tidal water, in addition to these effects of fresh water, have you taken any means for ascertaining whether any improvement takes place in the tidal wave of the river?—I have.

2564. With reference to tide gauges, have there been self-acting tide gauges affixed at different parts of the river?—Not self-acting gauges, but they have been watched by observers; we have only one self-acting tide gauge fixed in the river; that is at the Low Lighthouse.

2565. That does not belong to you?—No, it does not belong to the Commissioners.

2566. Do you have the observations of that gauge regularly sent to you?—No; it belongs to the Trinity House.

2567. You have no other self-acting tidal gauge up the river?—No.

2568. Would it not have been very important?—It would only show the case at one particular point, and that I fully ascertain by my own constant observation.

2569. Have you constant observations, or tolerably constant observations of the rise and fall of tide at different points in the river?—Yes; I am constantly making observations as to the effect produced by the works.

2570. Have you at different points of the river tide gauges, and careful observations made, if not always, yet very frequently?—Not very frequently.

2571. How frequently?—That is to say in each year.

2572. How many days in the year?—Two sets of spring tides were taken this last year, the best of the tides. I should observe, that one good tidal observation in a pure state, that is to say, when there is no disturbing cause from fresh water in the river, is worth a hundred as regards the tidal column when it is mixed with fresh water; and that I have generally endeavoured to get.

2573. Three, such you think equal to pretty nearly a hundred of the others?—Yes; they are of very little use if there is fresh water in the river.

2574. Three good ones, if they concur at all, would give as much evidence as 100?—I always endeavour to take them when the river is in a very dry state.

W. A. Brooks, Esq.
29th January 1855.

2575. As you have no self-acting machine, are those observations taken carefully with a watch, and is the watch compared, and are the levels of the points ascertained?—Yes, upon tidal gauges which are set to one uniform level, and they are watched every five minutes; the watches are set, and I and my assistants are going up and down, either by steamboat, rapidly, or by the railway.

2576. It appears upon the notes, that you have not levelled up to Newcastle Bridge?—Yes, it stands that I did not level when I took the original tidal observations, but I have levelled up to Newcastle Bridge. I made my observations, I think, in 1846; then I did not level.

2577. When did you level?—In 1849 I first levelled. In my observations of 1848, the gauges were all set by observing the high-water line.

2578. But somewhere about 1849 and 1850, you did carry a level up to Newcastle Bridge?—Yes; I carried the levels right up to Hedwin Streams.

2579. And once or twice a year you have observations taken?—Yes.

2580. At how many points?—15 or 16 different points.

2581. By 15 or 16 different observers?—Yes. Of course you are aware, as a professional man, of the immense difficulty of getting all these men to do their work well.

2582. As a result of these late observations, do you say that the low-water mark is lowered at Newcastle Bridge?—Certainly.

2583. And shall you be able to produce documents to prove that?—I shall be able to prove it by documents.

2584. Is not the high tide raised at the same time?—No, I do not find that the tide is raised.

2585. How much is it lowered?—A foot at Newcastle; about 9 inches at Bill Point; about 4 inches lower down.

2586. Although you seem to attach a good deal of importance to the fresh water, you admit the great importance of increasing the quantity of tidal water, of course?—I do strongly.

2587. You are aware, I presume, that the amount flowing up the river is considerably diminished by the resistance at Bill Point?—I know that that is the fact.

2588. You have examined, of course, the tidal observations of Mr. Rendel?—Yes.

2589. Have you looked through those observations, and gone thoroughly through all his papers?—I have.

2590. If that is the case, how is it you have not done more towards the removal of Bill Point?—If it were done in the present state of the navigation, or before the discharge of the freshes had increased, I believe it would only bring up the sand again. When the Bill Point was originally cut down, it was cut down to about 18 inches below low-water mark of spring tides; the sand dries——

2591. Was that before those groins of yours were put?—Yes.

2592. How long have those groins been erected?—The St. Anthony's or Bill Point jetties were commenced in October 1847, and finished in November 1847.

2593. Do you or not think that the removal of Bill Point, and the probable effect which it would have upon the tidal wave, would be of great importance?—I think it is of importance to remove it further back.

2594. Do you think it of great importance. I put the word "great" intentionally, because I confess it occurred to me to be about as important a matter as any?—It is an important work to remove it, to a certain extent.

2595. What is it that governs the selection of the progress of the works; the order in which they occur?—The works were commenced by my predecessor.

2596. I mean, since you have been here; you were here long before 1847. I ask you what it is which influences you in advising the order in which the successive works are prosecuted?—Those parts of the navigation which more require it. For instance, with regard to Bill Point, it was a very dangerous part of the navigation, and I urged strongly to have power to effect those works.

2597. Do you think that the various works which have been undertaken since 1847 have been, all of them, or most of them, more important than the removal of Bill Point?—They have been more important as regards the effect upon the bed of the river.

2598. When do you expect to attack Bill Point?—At one of the last meetings of the River Lines Committee, it was agreed to recommend the further removal of Bill Point; no resolution has been come to by the general body authorizing it yet.

2599. As to the shoals which show themselves from time to time in the river, and are most injurious to the navigation, what do they generally consist of?—Sand.

2600. When you have dredged, what have you principally dredged?—Sand; that is, sand at the coal staiths. I never recommend dredging the sand when I can be allowed to construct works to drive that sand away.

2601. Has the material which you have, generally speaking, dredged up been sand?—Generally so.

2602. And are the old shoals mostly sand?—Mostly sand; but some consist of ballast and coal mixed. A question was put to me as regards the dredging to let the Sardinian frigate go down. There was a bank which would not allow her to go down, but it consisted of ballast and coal. It was dredged to a greater width than was generally requisite

W. A. Brooks, Esq.
29th January 1855.

for the vessels which go down the river, to allow this vessel to go down, and to let her go down also early on the tide, because going down with a falling tide, of course, is more dangerous or more difficult than coming up with a flowing tide.

2603. Is there not a great deal of foreign substance admitted into the river from the banks, and thrown over from the ships?—There is a great deal thrown in the river; the Shields ballast keelmen are very much in the habit of throwing the ballast into the river above Shields. I have several times observed heaps of ballast standing above the water even. We do our best, of course, to punish these parties for it; they are brought up and fined.

2604. With regard to the materials which you see dropped in, there are considerable quantities under all the wharfs and loading places; do not you think that that adds rather considerably to the quantity of material supplied for the shoals?—It must add to it, certainly.

2605. What means do you adopt to prevent or remove that?—The harbour-master has given notice to the proprietors of the wharfs, and the Commissioners' attention is directed to it on their river views.

2606. Does it end there?—No; it ends in notices being sent to the parties to enforce the removal of the ballast.

2607. Does it end there?—They can compel them to take it away.

2608. But does it go away?—A great deal which is dropped overboard, I believe, does not go away at all.

2609. In looking at it myself, I see great quantities at the wharfs and places along the river, which have every appearance of being old constant accumulations, and which one might suppose would add to the material for the shoals?—I do not think that it does add materially to the shoals at all.

2610. Is it under that impression that you do not vigorously pursue the removal of it?—The removal is attended to. You will see chalk alongside some of the quays; now that chalk being worth at the present time half-a-crown a ton, it is not very likely to be thrown into the river.

2611. It is not worth half-a-crown a ton to the man who is at work with a shovel casting it. So was the coal, I dare say, which you dredged up from the river. However I saw large quantities, and I wanted to know whether you attach much importance to it, and what steps you take to prevent it?—There are several works down the river where I know that chalk is visible; one is St. Anthony's Reach, where the chalk is quite visible, bare at low water, but that is in a sheltered situation, and I do not believe it goes away there.

2612. Have you the cost of dredging?—Yes, it is about 9*d.* a ton.

2613. I attach a good deal of importance to the material thrown over in this way, and therefore will ask some further questions at the suggestion of some members of the Commission. Do you know what means there are for enforcing the removal of those heaps?—The parties can be fined for allowing rubbish to go into the river.

2614. Does any portion of that fine go to the informer?—I believe it goes to the informer.

2615. Then there ought to be a pretty good revenue of fines, I should think. Is the fact, however, that which I thought I saw with my own eyes, that there are very considerable quantities at this moment all along the shores of the river under the wharfs and staiths, and other places?—I do not think there are very considerable quantities. I do not think there is a considerable quantity which would be washed away. Taking one or two quays, for instance, I do not think they are in those parts of the river which are liable to be acted upon by the current.

2616. Has not the river police some power of interfering in it; directing parties to remove that material when it is thrown into the river?—That is under the direction of the harbour master.

2617. And it is his neglect?—It is certainly the harbour master's neglect, if any. I do not like, as an engineer, to have to do with laying informations.

2618. Have you the dredging returns? (*The same were produced.*) I want merely the general amount which you have expended in dredging between 1843 and 1850, and the general amount which you have expended upon works?—All the tables are there, and they can be taken out readily. I cannot myself answer the question, but I will have it put in.

2619. Can you tell me off-hand what it was in 1854?—About 4,000*l.*; the general expenditure lies between 3,000*l.* and 4,000*l.*, that is my memory; and previously it amounted to about the same.

2620. Was it so before 1851?—About the same.

2621. About what, at that period, did you expend in what we may call the river works from 1843 to 1850?—About 4,000*l.*; the expense of several years would range between 7,000*l.* and 8,000*l.*; the total cost of the dredging and the river works.

2622. Prior to 1851, that is to say, from 1843 to 1850, or thereabouts, you say you expended in dredging some 3,000*l.* or 4,000*l.* a year?—Yes.

2623. About how much, during that time, did you expend in what we may call river works?—About the same amount, 3,000*l.* or 4,000*l.* a year.

2624. Then have those river works diminished so very much since the new Commission in 1850, that they will not average 1,800*l.* a year from that time to this? In 1853 the amount was 4,600*l.* in dredging, and 2,200*l.* river works?—Yes. We have had no jetties made recently, that is the reason.

2625. But 2,200*l.* is the largest amount for river works which we have furnished to us?—Altogether they have not cost more than the 17,000*l.* which I estimated.

2626. I think, in 1851, you only expended about 1,300*l.* in river works; in 1852 about 2,100*l.* and in 1853 about 2,200*l.*?—Yes.

2627. Prior to 1851, from 1843 up to 1850 inclusive about what was your expenditure on river works?—About 4,000*l.* a year for river works and quays.

2628. Apart from the dredging?—Apart from the dredging. The total expenditure was very nearly 8,000*l.* as far as my memory goes—between 7,000*l.* and 8,000*l.*

2629. Then am I to understand you that, from 1843 to 1851, you expended nearly 4,000*l.* a year on river works?—Yes.

2630. And that from 1851 to the present time, you have dropped down to 1,800*l.*?—Yes; the works have not been ordered by the Commissioners, there has been so much dispute about the progress of the works, and so much opposition raised by a part of the Commissioners to any further works.

2631. At that rate, when will they ever be finished?—If the majority determine to act upon their own opinions they may soon finish them, but there is evidently a desire to conciliate the opinions of the minority as much as possible, and that has had a great effect in retarding the works. I think it would be more desirable for them to act upon their own opinions.

2632. What will be the effect, as to time, upon the river? How long will it take, at the rate which is now going on, to complete the river works which are contemplated?—It will take a good many years.

2633. Ten years?—About that time.

2634. I suppose if you had the money and the order to proceed a couple of years would suffice for making the groynes which remain to be made?—I am quite satisfied they could be made in a couple of years. I mean the walls connecting the ends of the groynes.

2635. What would they cost?—Nearly the whole of the groins are made. In the parts of the navigation where I propose to enclose bights, it must be done eventually by quays. That would be, of course, very expensive; but those quays would be executed by private individuals, but the pure river lines might be executed in two years.

2636. Therefore, the commencement of the advantage to the navigation which is anticipated by the carrying out of the works which at the outset we agreed were those which you determined upon, might be obtained in two years from the present time?—Certainly; I am quite satisfied of that. We have abundance of material on both sides of the river.

2637. Has it been want of funds which has retarded the progress?—That influences it partly. It would influence the carrying of it out in such a time; but I think the Commissioners have power to borrow money. They have had larger charges to meet.

2638. Has it been the want of funds during the last few years that has at all restricted your proceedings as an engineer?—In some respects I must say that, because there have been heavy amounts to pay for Parliamentary contests.

2639. As an engineer, in carrying on these works with respect to the dredging, suppose you would feel it your duty to effect it at as cheap a rate as possible?—Yes.

2640. I see the dredging has cost you somewhere about 1*s.* 0¼*d.* a ton; at least, the last year?—Not so much as that, I think.

2641. 12·24*d.* is what I make it out?—That is the last year. That involves some heavy repairs. I generally estimate about 9*d.* a ton as the cost of dredging, upon the average.

2642. Of course, if you could dredge at half price, that saving might enable you to do double the amount of your river works in the same year?—Yes, if you could; but I do not think you could.

2643. What is it which constitutes the great expense of your dredging; the removing of the material?—The great expense is the maintenance of machinery and craft, and the deposit of material.

2644. The maintenance of machinery and craft, apparently, does not cost 3*d.* out of the whole from your published accounts. The expense seems to be principally in the hire of keels and the getting rid of the material. How much does that cost? Is it possible that it should cost so large a sum in the River Tyne. The thing is done elsewhere at much less?—It costs about 9*d.* here, and I think you will find that in other rivers it does not cost less than that. I believe it costs more in the Clyde; or about the same, at all events.

2645. Take an example of cheaper dredging in the Wear, what are the great differences between the two cases, that would account for the apparently great difference in the cost of dredging and lightering in the one river and the other?—The system is quite different there.

2646. Why could not they be assimilated?—In the Wear they are merely working near the harbour's mouth; it is like raising ballast; a mere ballast machine similar to raising the ballast to supply vessels, and that is very close to the harbour's mouth, so that they are enabled to use these hopper barges and carry it to sea at a much less expense than in the river Tyne. It is a different system of dredging altogether. If we were dredging simply in Shields Harbour in the same way, making a great hole, for they scarcely move the dredging vessel from the spot where they are at work, we could also do it very cheaply. Our system is cutting a uniform channel, and endeavouring to make a level bed.

2647. That would account for the difference in the actual cost of dredging?—Yes. If it were the mere raising of a body of sand, I could do it a great deal more cheaply; but the cutting of a level channel is a different thing altogether.

W. A. Brooks, Esq.

29th January 1855.

2648. The cost of dredging, that is to say, the lifting from the bottom up to the barge, does not appear in your case to be very high. The published accounts of 1853 furnish one the means of estimating pretty nearly the cost of dredging as distinguished from the cost of lightering?—Yes.

2649. But the cost of raising and getting rid of it does appear to be high?—Yes, it is high, on account of having hired craft.

2650. But why should you have hired craft? Are there any reasons, and what are those reasons why you should not get rid of the material dredged as cheaply in the river Tyne as in the river Wear, except the little circumstance which you mentioned, that they are dredging principally near the mouth (but I know they are dredging higher up), and you would be dredging higher up, which we all know in the lightering and the handling of craft on a tidal river, does not make a very great difference in the cost of moving it about?—It would make a very great difference in this river. The Act of Parliament provides that none shall be delivered within two miles from the bar.

2651. Do you as an engineer, and the engineer of the Commissioners, say, that you could not carry the ballast dredged and get rid of it more cheaply than in the way in which you do it now?—If I were allowed to deposit all between the groynes, I could get rid of it much more cheaply; it used to be delivered at $1\frac{1}{4}d.$ a ton.

2652. What is it that prevents your depositing it between the groins?—There is a very great objection raised by the members of the Board.

2653. I thought I gathered that there was no resolution preventing it, and that one had been moved but not carried, which would imply that it was done and could be done; is it not done?—We have to wheel it out now.

2654. But do you not deposit it now between the groins?—In some places we do.

2655. I must be content with your answer as an engineer; as the engineer of the Commissioners, could not you set your wits to work and get rid of that dredged material at a good deal less than you do now?—If I had more craft I could.

2656. Taking the ordinary means that anybody would take to carry on a work, could you or could you not get rid of that material at a good deal less?—I could if I had more craft.

2657. If the average price at present is 10*d.* or 11*d.*, I think it is more than 9*d.*, but say 9*d.*, and if you could knock off 20 or 30 per cent. from that, it would give you a very large additional sum for your river works?—It would.

2658. Am I right in saying, that for three or four years past the cost of dredging has been rather more than double the sum which you have expended on river works?—I believe it has.

2659. 3,000*l.* to 1,300*l.* in 1851; 3,900*l.* to 2,000*l.* in 1852; and 4,600*l.* to 2,200*l.* in 1853?—That is in those three years.

2660. What would it be in 1854?—I should think about the same; there were the same number of craft employed, and only one dredging vessel. My object, as an engineer, is to dredge as little as possible.

2661. Still you are obliged to spend upon dredging 66 per cent. of the amount which you have to expend upon your engineering works?—Yes, that is owing to the works not having been carried out.

2662. Therefore it would be very important to diminish that 66 per cent., and increase the 33?—It would; the Commissioners are now buying, or about to buy, fresh craft; it has been a subject under their consideration.

2663. For going to sea?—Yes.

2664. Hopper craft?—Hopper craft; it has been pressed very strongly upon them; but I am afraid myself, as an engineer, that there will be a great difficulty in working those craft in this river; they will be of a great draught of water, and I believe it will be difficult to work them; they will be 9 feet; they will answer very well in the lower part of the river, but not well in the upper part of the river.

2665. (*Captain Fitzroy.*) As a matter of fact, has any material, dredged up by the dredger, been carried to sea by craft employed by the Commissisners?—No.

2666. Has any material, taken up by the dredger from the bottom of the river, been deposited anywhere, except between high and low-water mark, upon the shores?—No, only between high and low-water mark upon the shores; the ballast from ships is above high-water mark, but not the dredged material.

2667. (*Mr. Brunel.*) As regards the ballast from ships, you are only so far affected by that, as it is a source of funds to carry on engineering works?—Yes.

2668. And therefore, perhaps, so far it affects the engineering works sufficiently to justify my asking you a question or two about it. How is the ballast from ships disposed of?—Some is taken on to the dry land, and some is put between the groynes; there are several establishments where it is put between the groynes.

2669. When it is put between the groynes is anybody paid for the privilege of putting it there, or is it simply the cost of putting it there?—Simply the cost of putting it there; no owner of adjacent land receives any benefit from it; the Commissioners consider that they have a right to deposit it for their own works.

2670. Then that would be the cheapest way, I suppose, of getting rid of ballast. I see various prices named as the cost of getting rid of ballast from ships, does that result solely from the position that the ship is in, and the facility of getting the ballast away from it, or what other cause?—Some are grants of old date, when the parties received a larger price for the work.

W. A. Brooks, Esq.

29th January 1855.

2671. Why is not the grant made to the party who takes it cheapest?—Because a licence has been granted which cannot be revoked for certain number of years.

2672. When the ballast comes out of the ships is it obliged to go in certain proportions to different places?—No; a party who has a licence gets of course as much ballast as he possibly can.

2673. Here is a large quantity of tons, for which you pay 11½*d.* to get rid of it?—I have no objection to answer the question, but there are parties who understand the subject better than myself.

2674. However, as an engineer, having to get rid of this ballast from the ships, if you were at liberty to get rid of it in the cheapest possible way, what would you do with it?—I should put it between the groynes, to bring the action of the current more rapidly into effect.

2975. What would it cost you to get rid of the ballast from the ships in doing that?—It would not cost us, I think, more than 4*d.* a ton.

2676. The whole expense?—I think the entire may be done for that.

2677. There is one point upon which, as an engineer, you are competent to give an opinion, and we will see afterwards how it applies; you, as an engineer, can form a very good notion of what it would cost you to get the ballast out of a ship and to send it and deposit it between the groynes?—Yes.

2678. You think you could do it for 4*d.*?—Yes; it has been done for 4*d.* The Corporation only paid 4*d.* a ton to one party, and only 6*d.* to another.

2679. Of course there are large spaces of land which will be enclosed by your river walls, the raising of which will materially enhance the value of the property behind them?—I believe it will.

2680. And it will make valuable land out of that which is now mud?—It will.

2681. Therefore the owner of such land would at least be glad to receive the ballast upon it?—He would.

2682. As to the means which you have adopted for ascertaining whether a beneficial effect has or has not been produced upon the channel of the river by the works which have been in progress, something has been thrown out with reference to the means of ascertaining it; have you made any soundings in 1849 or 1850, and again in 1854?—Of 1849 and 1850, there are soundings upon the table of my own.

2683. Have you made any lately?—Lately, they were all taken by Mr. Comrie.

2684. You have not made any lately?—Not this year.

2685. Mr. Comrie made surveys and sections in 1849?—Yes.

2686. About the same time that you did?—At the same time that I took the soundings above bridge.

2687. Then you have not taken any soundings below bridge?—Not since 1849; not a general sounding; there have been no complete soundings of the river below bridge since 1849, except in 1854; the soundings in 1852 did not extend to Shields.

2688. Are there any soundings put in made by you below bridge?—Yes.

2689. In 1849?—Since 1849.

2690. In what year?—In 1850, 1851, and 1852, that is to say, local soundings in the same line as Mr. Rennie's; in some instances closer, in intermediate lines.

2691. At particular parts?—Yes.

2692. At the ends of the groynes?—Wherever any material alterations were going on, in order to ascertain the effect of the works.

2693. You made them at that time not generally, and they were not extensive?—The soundings were taken to show where material alterations had been made in the bed of the river, by the construction of recent works.

2694. Are there any soundings over those same places made by Mr. Comrie in 1813?—Yes.

2695. And there are soundings made by Mr. Calver over the same places in 1849?—Yes.

2696. In 1854, are there soundings made by Mr. Comrie?—Yes.

2697. And also by Mr. Calver?—A partial sounding made by Mr. Calver, particularly at Hebburn, where they correspond very closely with the soundings made by the late Mr. Comrie, there were soundings made by order of the Commissioners, before the works were made at Hebburn. I made soundings showing the then state of the river, and the progressive effects are shown.

2698. Would you concur in the fairness of this mode of ascertaining as far as possible, from the data before us, what has taken place, that all these soundings should be assumed as facts.—I do not hesitate to say, that I myself should put entire faith in anything which bore the name of Mr. Comrie, and that I should also place entire faith in the soundings as they have appeared to be given here by Mr. Calver?—They are certainly extremely accurate.

2699. Provided we had those soundings and data, uninfluenced and unaffected by any opinions and any theories and beliefs founded upon them, if all those soundings were taken as facts, and the averages drawn from them at different periods, over those parts of the river where they were in common, it is possible some accuracy of result might be obtained?—Yes.

2700. Do you concur in that, and would you aid in arriving at it?—I would. I should

W. A. Brooks, Esq.

29th January 1855.

be quite satisfied to leave the results to what is shown upon the bed of the river. The soundings will test the value of the operations.

2701. I refer to all the soundings which can be collected, either Mr. Comrie's, Mr Calver's, or Mr. Brooks', and the proposition is, that where they have been made at the same time and over the same points, the average result should be ascertained?—They certainly agree very closely; it is astonishing how closely Mr. Calver's agree with Mr. Comrie's generally.

2702. And that certain measurements should be made from those average sections, and the Commissioners probably will point out what they shall be?—Yes; I am quite satisfied with that, bearing in mind that the works are not even yet completed, and therefore it is not fair to test the value of the works so early. As regards the effect already produced, I am quite satisfied.

2703. Have you any plan upon which the works actually executed are laid down?—The general plan which I laid before the Commissioners.

2704. They are there in pencil?—Yes, and in ink. The sections of 1854, by Mr. Comrie, are all down the river, from Newcastle Bridge to the bar, and below the bar.

2705. (*Captain Fitzroy.*) Along the river?—No, they are transverse sections.

2706. Repeating all his former soundings?—In the same position.

2707. (*Mr. Brunel, to Mr. Comrie.*) Not everywhere, are they?—Yes, in the very same lines.

(*Mr. Webster.*) There are some places upon the shores, Sir, where they are not.

(*Mr. Comrie.*) Yes, there are one or two places on the shores.

(*Mr. Brooks.*) A few places are left out up the bights.

2708. (*Mr. Brunel.*) Is this the only general plan upon which you introduced the works as completed?—That is the plan.

2709. And the only one?—The only one.

2710. Are you aware that in the mass of valuable papers which Mr. Rendel gave in upon his survey, there was a comparison of the sectional area as between 1813 and 1849?—Yes.

2711. Have you observed that the total cubic contents of the river below low-water have materially altered between 1813 and 1849—that they have increased to the amount of 9 per cent?—Yes. I am getting calculations made now, to show that the increase is very much greater, 1849 was too early to test it at all.

2712. The total tidal capacity of course has diminished to a considerable amount, because you have been contracting it?—There has been a more valuable and energetic tidal column brought into action than before.

2713. Which will be proved by the tidal wave, if we find that the quantity is materially increased by it up above the river, as to which you are to furnish us with tidal observations?—Yes.

2714. (*Mr. Webster, through the Chairman*). Was not this the plan by which you proposed to obviate the objection to cutting of White Hill Point?—Yes, that is one of the plans for furnishing dock accommodation.

2715. Was not it to obviate the objection which you have referred to from cutting off White Hill Point, when you proposed to cut it off some 200 feet within Mr. Rennie's line?—That was the object, to convert the frontages at South Shields, where vessels now lie, into a wet dock, and then I considered that the other might more safely follow, that is, taking in all the present coal staiths.

(*Mr. Webster.*) That is preserving the line of Smith's Quay, which is within Rennie's line, and which was the line to which the Coble Dean Docks were to come out.

2716. (*Captain Fitzroy.*) In continuation of Mr. Brunel's question just now, I wish to ask you a question. It appears to me very remarkable, according to this return, that from high water down to the bottom, including the whole bed of the river, the total cubical contents of the river, as estimated by a comparison of the surveys of Giles, Comrie, and Calver, have been found to differ only seven-tenths per cent. between 1813 and 1849; the increase of the low-water contents has been nine per cent.; the decrease of the total contents has been only seven-tenths per cent.; do you believe that this may be taken as an accurate estimate?—I believe it was very carefully taken at the time by Mr. Rendel's assistants, and I believe they were all taken from the datum level down to the bed of the river; that is, assuming that the receptacle was filled up.

2717. It is a very remarkable fact, that between 1813 and 1849 there should have been only a fraction—not even one per cent., but sixty-eight is the decimal, only seven-tenths per cent. diminution?—It was done with great care and at great expense. If the true body of water could be ascertained, which was thrown into the river in Mr. Rennie's time, as compared with the present time, I think it would be much more in favour of the works.

2718. Three years would not make much difference?—It would make a great difference as regards the depression of depth. If you only refer to the late Mr. Comrie's survey, you will see that it has gone down generally from two to three feet in the Long Reach. There has been a great depression of the bed. Allow me to say, that in 1849 the low-water surface was not depressed, because Hebburn Shoal existed in all its bad condition.

2719. That is in 1849?—In 1849 Hebburn Shoal acted as a dam, retaining the low water.

2720. Your impression being, that at present the low-water section is still more increased?

—Yes; the low-water contents should of course be calculated from the old low-water surface, otherwise we should lose in the neighbourhood of Newcastle one foot in height; in fact all the measurements should be from high water in its true state, not from a datum level which is only imaginary; that is to say, a level to which the receptacle is never filled at any instant.

2721. (*Mr. Brunel.*) What is your estimate of the cost of completing such works as are necessary in your opinion for securing the full benefit to the navigation?—I have not given any detailed estimate; the works have been so changed recently, on account of the new docks, that I have not made any estimate.

2722. I suppose somewhere between 15,000*l.* and 25,000*l.*?—That would put all below bridge, I believe, in a good train to propagate the tidal column very much better than at present.

2723. Not fully to carry out the improvements?—There are very important works above bridge.

2724. I should like to hear what those are?—(*The Witness produced a plan.*)

2725. This plan shows the works which you would introduce above?—Yes; there would be an immense addition to the tidal column if the works were made above bridge. It is now consisting of a series of pools and shoals; if the works were made above of the same nature as those below, they would depress the shoals and allow the escape of the fresh water, and give a very large increase of tidal volume. Mr. Rendel also entered fully into this point.

2726. Is there any rough approximate estimate of the cost of carrying those works out?—I gave one in my report; an estimate was given when the application was being made to Parliament in 1850. I planned the works above bridge, and Mr. Rendel planned the piers at the same time; the detail is in the Admiralty inquiry.

2727. Do you remember if at all?—A very small amount, about 21,000*l.*; that is principally for jetties; it would cost more if connected with rubble walls.

2728. Then that 21,000*l.*, did not include training walls?—No; the result of these groins (*showing the same*) was a considerable depression of the bed.

2729. Is not there a large quantity of sand and material brought down this river from above?—A very great quantity.

2730. Do you know where it comes from?—It is washed away from the banks by the heavy floods, and also a great quantity of material is thrown in at the lead works, where the stone is crushed.

2731. Something very large?—Very large indeed; but the power of the water is quite sufficient to carry it away.

2732. It brings it down to you?—I do not find the river any worse afterwards.

2733. But is it not brought down to all these large sandbanks which we see north of Newcastle Bridge, which keep up a good healthy supply of shoals below Newcastle bridge?—No; I think when that material is brought down by the floods, the floods themselves are so energetic that they do not allow it to rest.

2734. Have you at all ascertained, by comparing the sand from the lead works and the sand upon the shoals, whether it forms any large portion of it?—I have never witnessed anything; it seems to be crushed material; it is very fine sand.

2735. The crushed material would not be finer than that sand?—No, it would be coarser.

2736. Then it would not go so far to sea as the fine sand?—No.

2737. The crushed material from the mines is not likely to be so fine as the sand which you find at the mouth of the river?—Certainly not.

2738. And not so likely to go to sea?—No, but the force of the flood is such that it carries it way; I have never seen it at low water at the bridge.

2739. How many different workings are there up there?—Forty or fifty I am told.

2740. In fact if you counted every little one they would run up to fifty, sixty, eighty, or one hundred, perhaps?—I have not been up in that district, and cannot speak to it.

2741. What will they wash out a-day, do you think?—I can get evidence upon that point.

2742. Ten tons a-day a-piece?—I should say more than that.

2743. That is 500 tons a-day?—It will be brought before you. The Commissioners have no power of checking that.

2744. (*Captain Fitzroy.*) There is a material question with reference to the depth of water just below Newcastle bridge in continuation of Mr. Brunel's question. It appears in Mr. Smeaton's report, when he was referred to upon the washing away of two or three of the arches of the Tyne bridge in 1771, that he says, "This flood was 3 feet 6 inches "higher at this bridge than the memory of man or tradition has ever taken notice of, and "the ground or bed of the river a little below the points of the sterlings on the east or "lower side of the bridge is gulled away so as to produce a depth of 27 feet 6 inches of "water at low water, when at a medium there is only between 7 and 8 feet depth of "water in the river immediately above the bridge or on the west or upper side of it. And "circumstance is now mentioned to show the danger the four remaining arches still "continue exposed to by standing as it were upon the edge of a precipice." Taking it for granted that Mr. Smeaton's view of that gullying away of the water below the bridge is correct, and under the present circumstances the bridge impeding very much the ebb of the fresh water, is there a gullying away, as he expresses it, of the water now below

W. A. Brooks, Esq.
29th January 1855.

Newcastle bridge, and if so, may the depth of water at low water there be dependent upon that cause rather than upon any improvement or alteration in the state of the river below the bridge?—No; there is deep water immediately below the bridge, but it does not extend to any distance; it is a mere pool caused by the overflow or discharge of the floods.

2745. That does not affect Ouseburn?—No, it does not go 100 yards.

2746. As you refer in the measurements of the river to the depth at low water opposite to Newcastle or near Newcastle bridge, and there are no means of connecting that measurement with anything except a low-water datum level of Mr. Rennie, is there not a want immediately apparent of some datum level at mean tide, a mean water level rather than a level starting from a datum at either low or high water?—Yes.

2747. It is a desideratum in a critical examination of the state of this river, that there should be a mean tide level as a datum rather than an extreme either below or above?—I quite agree with you that that is most desirable.

T. J. Taylor, Esq.

THOMAS JOHN TAYLOR, Esquire, sworn.

Examined by Mr. Seymour.

2748. I BELIEVE you are mining engineer to the Duke of Northumberland?—I am.

2749. Have you paid considerable attention to river improvements?—I have.

2750. Have you given evidence upon the subject in Committees of the House of Commons and before an Admiralty Inspector?—I have.

2751. Have you also published a work upon river improvements?—I have. I may remark, that the work which I published was quite irrespective of any investigation going on; I took the question upon independent grounds, without reference to any particular inquiry.

2752. Did you also publish a letter, of 5th February 1852, addressed to the Commissioners for the improvement of the Tyne, published, I think, in answer to some statements of Mr. Calver?—I did.

2753. Your attention, I presume, has been called to the general condition and cha racter of the basin of the Tyne throughout?—It has.

2754. Will you state the conclusions to which you have come?—I made it my business to investigate very particularly, not only the lower part of the basin of the Tyne, but the whole of the basin of the Tyne to the source, about 80 miles from the sea, and to found my views, as far as I possibly could, upon a general view of the whole tidal basin, as well with reference to the lower part of the tidal basin as the upper part of the basin. I shall now, with your permission, describe the tidal basin of the Tyne.

2755. (*Mr. Webster.*) That is in your book?—It is, to a certain extent. I wish to add a few observations with regard to the fall of rain. The average height of the basin of the lower Tyne is nearly 450 feet above the level of the sea; the western portion of the basin is mountainous, and consists of hills rising 1,200 to 1,500 feet above the level of the sea. At the confluence of the Kielder and the Tyne, which is about 70 miles from the mouth of the Tyne, the rise above the level of the sea is 550 feet, making an average of from 7 to 8 feet per mile throughout the extent of the basin. Beyond that the basin rises very rapidly. The tributaries which contribute to the river possess the character of torrents. The rain that falls throughout the extent of the basin has been underrated a good deal. At the eastern extremity it is low; it consists at Tynemouth of about 20 inches and 37 parts, upon the average of several years' observations, exclusive of the very wet year 1852, which I did not take in, because I conceived it was an extraordinary year for the fall of rain, therefore I exclude it from the average which I am now giving. The western part of the lower Tyne gives 33 inches, and the average of those two is 26·87 inches; but taking the lower Tyne it is $28\frac{8}{10}$ths. The Kielder and Allenheads constitute the western portion of the basin of the Tyne, which is one of the wettest districts in Great Britain. The western part of the basin of the Tyne is remarkably wet, and the lower portion is remarkably dry; in the western part the average proportion of rainfall is 51 inches. In one part I remember, at Kielder, from the rain-gauge which I kept there, 17 inches of rain fell, which was a very extraordinary quantity. The average of that part of the basin is 51 inches. The average of the whole area of the basin is 39·94 inches, which may be considered 40 inches. Upon the area of the whole basin, which is 1,142 square miles, this amounts to 3,530,000,000 and odd cubic yards, and allowing two-thirds to be evaporated, which is very ample, because the principal quantity of rain falls in the tidal basin of the Tyne during the winter months from October till February when the evaporation is very trifling, 1,308,859,094 cubic yards pass down the tidal basin in twelve months. The calculation has been made, I am aware, before, making it about 800,000,000; but that calculation has been made without a due knowledge of the whole rain that falls throughout the extent of the tidal basin; it is in the proportion which I state.

2756. (*Mr. Brunel.*) If you reduce the quantity to days, is it not 3,700,000 a day?—It comes down the water course of the country in eight or ten floods.

2757. Have you made a calculation of the daily average?—No; it would be false, for this very obvious reason, that the floods make their way down the river very rapidly; the

western slopes of the basin are extremely rapid, and the quantity of water discharged is, to a great extent, discharged in very few floods comparatively; there is an average of about from 60,000,000 to 80,000,000 cubic yards to each flood, which, I believe, is about three times the quantity of tidal water in the Tyne during one spring tide.

2758. (*Mr. Seymour.*) Is there anything further which you have to state upon that point?—Not at present; in the course of my examination I shall have an opportunity of referring to it.

2759. The attention of the Commissioners has been called to the Coble Dean Inlet; have you any observation to make to the Commissioners with respect to that inlet?—My proposition was to enclose the Coble Dean Inlet entirely with full-tide walls, upon the same principle that I would enclose other inlets of the Tyne, such as Jarrow Slake, with a view to propelling the tidal water to the upper parts of the basin.

2760. Between Jarrow Slake and Bill Point, can you tell me how much space the 8 feet low-water contour occupies?—For my own satisfaction in publishing upon the subject, I made a calculation between the contours of 4 feet at low water of the previous state of the Tyne, and upon the same soundings of the subsequent state of the Tyne, and the result was what I shall now state. From Tyne Bridge to the Narrows, with 4 feet soundings at low water, per Rennie, in 1813, the width was 348 feet, and per Calver, in 1849–50, 460 feet, showing an increase in the low-water contours at low water of 112 feet. By another calculation (I made it twice over to verify my former calculation), I made it 111 feet. With regard to the areas, I made the area, per Rennie, 384 acres of the 4 feet contour at low water, and in 1850, the 4 feet contour was 515 acres; the difference being an increase of 131 acres on the 4 feet contour. I believe that Mr. Brooks has made a calculation, showing an additional quantity since that time on the 4 feet contours. I have not had the advantage of hearing his evidence upon that subject, therefore I cannot speak to it.

2761. You speak to 1849?—I do. I took occasion to make comparisons, and took a great deal of pains upon the subject to investigate the circumstances, and that is the conclusion which I came to; that confirmed me in the views which I took of the subject, my views having been previously formed upon general principles applicable to the improvement of rivers, whether tidal rivers, or rivers depending upon a certain quantity of back water being passed through portions of them.

2762. Have you extended your observation to the tidal volume of the river?—I have.

2763. Have you any observations which you wish to make with reference to your calculations upon the condition of the tidal volume?—I have. In following out my own views as to the improvement of the rivers, I had occasion to make several calculations, both as regards the volume derived from land flood-water in the Tyne, and also with regard to the volume derived from tidal waters; the result that I arrived at was what I shall now state. I proposed to enclose, with solid embankments, upon the principle which I conceive is the only just principle that can be applied in the case of a river like the Tyne, an extent which I shall now mention. I proposed to enclose Jarrow Slake, with an amount of tidal water, at full spring tides, of 2,300,000 cubic yards. I also proposed to enclose other portions of the river below bridge, including Coble Dean and Willington Gut, to the extent of 2,450,000 cubic yards. Above bridge, my calculations were that 500,000 cubic yards might be enclosed, making a total of 5,250,000 cubic yards, comprising an extent of 217 acres. To replace the tidal water which I abstract in the way that I am now describing, I provide a basin, which I think is very adequate to make up for any deficiency or supposed deficiency, in the western part of the river; that basin I shall now describe. From the Narrows to Newcastle Bridge, the total length is 49,896 feet. The mean height of the sand above the bar level, which I propose to act upon, with a view to create the new tidal basin which I have mentioned within that space of 49,896 feet, is 4 $\frac{98}{100}$ths of a foot. I expect that these figures are accurate. Above bridge, I have calculated upon a mean height of 5 feet above the bar level, giving 3,539,690 cubic yards, with a total of 14,516,142 cubic yards. From this I deduct, from the Narrows to the east end of Jarrow Slake, 791,267, upon the ground that that portion is not available for the new bed which I propose to make for replacing the tidal water, leaving 13,724,875. To that 13,724,875, I add the deficiency of the tidal water in the western part of the basin, which has been shown by Mr. Brooks upon a section which, I believe, gives a very good view of the river; in fact the best view of the river that I have seen. I have calculated that, and I find it amounts to 3,983,735 cubic yards, making a total of 17,708,610 cubic yards, without allowing for the quantity impounded in the tidal basin, which is also shown upon the section which has been put in by Mr. Brooks, which, I calculate, amounts to 1,802,126 cubic yards, giving a total of 19,510,736 cubic yards; and deducting from that the space not available, being enclosed in the lower portion of the river, converted into solid ground, viz., 2,950,000 cubic yards, it leaves 16,560,736 cubic yards to replace the 5,250,000 cubic yards which I proposed, by my calculation, to abstract; that is to say, there is a provision in the upper portions of the tidal basin for about three times the solid capacity that I propose to abstract in the lower portion of the river, including the operation that I expect to be effected upon the bed, and including the deficiency of tidal water which has been already dwelt upon, and including also the impounded water which cannot make its way out to sea in consequence of the bad state of the section of the river; the capacity of the basin is 16,500,000 to meet 5,250,000. The object is to have the tidal water into the upper portion of the basin. It is a very curious fact that near Stella, which is close to the

T. J. Taylor, Esq.
29th January 1855.

upper portion of the tidal basin, the effect of the current action is such that the bottom of the river is below the level of the bar. Now, that circumstance seems to me, above all others, to show the capabilities of the river under a proper system.

2764. (*Mr. Brunel.*) You mean to say that there is a hole there?—It is not a hole, it is a winding of the river at that particular part; it is a reach of the river at that particular point.

(*Mr. Brunel.*) Here is a section of the river which confirms your statement, but which is not remarkable for a river.

2765. (*Chairman.*) Will you show us where the proposed basin is?—(*The Witness pointed out the same.*)—The district which I have, in order to replace the tidal water abstracted from the lower portion of the river, extends from Jarrow Slake westward, including the whole of the western portion of the river. The particular district which I now allude to, where the bed of the river at present is below the level of the bar, is this, (*showing the same.*) I contend that it is not a pool, it is a winding in the river which is produced by the action of the floods.

2766. (*Mr. Armstrong.*) What is the whole length of that winding, where you say the bed of the river is below the level of the bar?—About three-quarters of a mile.

2767. (*Chairman.*) Do you mean that you would form a basin there?—I look to the middle and upper portions of the river as the means of forming a basin in substitution of that which exists down below. I propose the entire portion of the river, from Jarrow Slake westward, to form a basin. I propose to deepen the upper bed of the river, and to substitute that.

2768. (*Mr. Seymour.*) In order to render the bed of the river a proper receptacle for the tidal water, do you consider that the sands which encumber the actual bed should be removed?—Certainly.

2769. Have you made any calculations of the amount of silt above the level of the bar in the lower portion of the tidal water?—I have; the amount of silt encumbering the bed in the upper and lower portions of the river is 13,724,000 cubic yards, in addition to which I calculate upon the deficiency of tidal water, which has been shown upon Mr. Brooks's section, and also upon the tidal water which is impounded in replacement of the deficiency or supposed deficiency of tidal water that may be abstracted from the lower portion of the river by the erection of tidal walls; that is to say, my calculation is to abstract 5,250,000 cubic yards of water at the lower part of the river, and to replace it in the upper portion of the basin, the capacities of which are such that I am enabled to assume that 16,500,000 cubic yards are available for that purpose instead of the 5,250,000 abstracted, so that I have three times the amount in the upper portion of the tidal basin from Jarrow Slake westward, of available space as compared with that proposed to be abstracted from the river.

2770. (*Mr. Seymour.*) You mean available space for the reception of tidal water?—Yes.

2771. The clearing of the receptacle affords a compensation?—By clearing out the receptacle, and by supplying the present deficiency of tidal section, and by getting out the impounded water from the river, I prepare a receptacle for any supposed abstraction from the lower part of the basin, three times as large as the amount of that abstraction.

2772. Then, in point of fact, the tidal volume would be increased if your improvements were carried out?—Very materially.

2773. (*Chairman.*) Will you be so good as to state whether these calculations have reference to Mr. Brooks's plans, or whether this is a distinct plan proposed by yourself?—I have myself proposed certain plans; as to a comparison with Mr. Brooks's plans, I can only say that I propose to exclude about 217 acres of tidal water.

2774. Is that which you have already given us your own distinct plan?—It is.

2775. (*Mr. Brunel.*) These calculations will not apply to those plans which we have had before us?—Not unless they are similar.

2776. But are they similar?—I propose to exclude 217 acres of the tidal basin in the lower portion of it; Mr. Brooks will be able to tell you what he proposes to exclude.

(*Chairman to Mr. Seymour.*) I do not much see what good this witness will do you.

(*Mr. Brooks.*) Mr. Taylor's plan very closely coincides with mine.

(*Mr. Armstrong.*) Can you answer the question of the test of Mr. Taylor's plan agreeing with yours.

(*Mr. Brooks.*) I can answer that question immediately.

(*Mr. Taylor.*) I believe that my plan does not differ from Mr. Brooks's very materially.

2777. (*Mr. Brunel.*) You are proposing the same general principle which Mr. Brooks has been explaining to us before, of improving the whole channel of the river, which would increase the tidal wave?—Exactly.

2778. We are not met here to consider various plans for the harbour of Tynemouth, but rather to inquire into what has been the operation of certain plans carried out by the Commissioners, and what is likely to be the operation of the plans proposed by the Commissioners. If the Commissioners propose to adopt your plan, of course it will be necessary to inquire into the probable operation of your plan, but we were told only half an hour ago that the Commissioners proposed to adopt certain plans which Mr. Brooks has prepared.—I believe that my plan is very close to his. I endeavoured to get Mr. Brooks to say so just now, and I think that he will say so.

2779. (*Mr. Armstrong.*) You know Mr. Brooks's plan, and of course you know your own?—Yes; and Mr. Brooks's resembles my own very closely.

2780. Are they so near to each other that the calculations which you have been favouring us with will apply with reasonable accuracy to both?—I have no doubt that approximately they do apply.

2781. (*Captain Fitzroy.*) But there is a point with reference to this particular plan which will at once show its uselessness or the contrary; I wish to ask the question, whether the sea tide rises at the place where this alteration in the bed of the river is proposed, and if so, how much?—If you will allow me to explain: I do not mean to make any particular place a tidal basin, but to substitute the whole extent of the river from Jarrow Slake westward.

2782. How much alteration will there be between your proposed low-water level and the present low-water level?—I should say about two feet.

2783. Of course the improvement, with respect to an admission of more tidal water, will only refer to that part which is above the low-water level?—That is assuming that the high-water level is only the same as it is now. If it is to be higher than it is now, of course that argument would not apply.

2784. (*Mr. Seymour.*) Can you state in your calculations the quantity of acres below bridge which you enclose, and that which Mr. Brooks enclosed; and what is the difference between them?—Mr. Brooks proposed to enclose 201 acres, and I propose to enclose 217. about 16 acres more, so that they are very approximate to each other.

2785. (*Captain Fitzroy.*) That proposed enclosure, being acreage, horizontally, without reference to depth?—It has reference to depth also, because the enclosure takes place in that portion of the tidal basin which does not represent so great a depth as the middle. The average depth of that which I propose to enclose is about 7 feet; 6 feet 11 strictly, but say 7 feet upon the average.

2786. Is Mr. Brooks' a similar average?——

(*Mr. Brooks.*) 201 was my original proposal.

(*Mr. Taylor.*) Mr. Brooks says that his depth is about the same; 7 feet average. I am speaking of high water.

(*Captain Fitzroy.*) The mere acreage can give no definite idea of the cubical contents of water.

(*Mr. Taylor.*) Therefore I state not only the acreage, but the mean depth of the water which I propose to enclose in the 217 acres. It is 7 feet.

2787. (*Mr. Seymour.*) What is your opinion with regard to half-tide walls, as compared with full-tide walls?—My opinion with regard to half-tide walls is, that they cannot be effectively carried out. I think the notion of half-tide walls in the lower part of the estuary of the Tyne is inconsistent. I shall be glad to explain what I mean by making a sketch. Suppose AB to be a particular reach of the river, I shall assume that the half-tide walls are constructed in the direction of EF. In the first quarter of ebb, and down to the half ebb, the current will set over the half-tide wall into the bight G, I do not see what is to prevent the current which comes down the river from setting, down to the period of half flood, into the bight. How can we control the proper operation of that current without putting a full-tide wall? The mischief is established, the silt is laid down here, and you go on having the silt forming here from time to time, making necessary a permanent and most expensive operation. This is not a solitary case. If you look to the course of the Tyne you will see that in all its course, where the current yields to this side, half-tide walls are not practicable.

2788. Do you think that if the principle is to be carried out, it had better be carried out completely, and not half done?—Decidedly. I think that there is no compromise between one principle and the other. I have considered a great deal upon the subject. I began with dwarf piling, and gradually moved up to half-tide walls and full-tide walls; and at last I have come to the conclusion that only full-tide walls are adequate to answer the purpose.

2789. That is your own experience?—It is my own reasoning and observation. In point of fact, the system has not been carried out anywhere yet.

2790. I wish to call your attention to the land floods, and their effect upon the river. Have you anything to state upon that subject?—I have already, I think, stated very fully my views.

2791. Which do you think to be the governing influence, the tidal water or the freshes?—I think the freshes, under proper control, ought to be the governing power in the river.

2792. Have you seen any remarkable freshes which have guided you in forming that opinion?—I have; I have quoted freshes which I had an opportunity of making observations upon, and I found that one of them discharged, according to my calculation, 80,000,000 tons in 24 hours. I had also an opportunity of referring to an observation made by Mr. Calver at Newcastle. I do not know whether he has stated it or not; that fresh was 14 feet at Newcastle Quay, and the rate per hour was 24,600 feet, between four miles and five miles an hour, past Newcastle Quay, where the ordinary ebb is not much more than half that velocity; so that, in point of fact, the effect, so far as can be judged from the observation which was made upon that occasion, is four times that of an ordinary tide, the velocity being double, and the effect being as the square of the velocity.

2793. During the floods of which you speak, what is the condition of the low lands of the Tyne? are they generally flooded?—In the very highest freshes of the river they are flooded.

T. J. Taylor, Esq.
29th January 1855.

2794. In your opinion, what would be the effect with reference to the velocity with which these freshes flow, if Tyne bridge were removed?—I think the velocity would be increased very materially, and the whole of the river would be very much improved by the removal of Tyne bridge. The resistance of the cross section of Tyne bridge is about four or five times the velocity of an ordinary cross section.

2795. In your opinion, has the Tyne Improvement Commission worked efficiently or not?—I think that the Tyne Improvement Commission has worked efficiently. I think that the works which they have projected are very beneficial to the banks of the Tyne, and to the Tyne itself; they have, for example, got an Act of Parliament for piers at the mouth of the river; they have also got an Act of Parliament for improved moorings in the river, also for the Hay Hole Dock, with regard to which I may observe, that perhaps no body, except one constituted as the Tyne Commissioners are, could have established a dock in the way in which it is established, for they are bound by their Act of Parliament to reduce the dues in the dock commensurately with the reduction of the debt, so that ultimately the expense to be paid by shipping frequenting the dock and coals shipped at that dock will be reduced to the expense of superintendence and the expense of repairs of the dock itself. I can scarcely conceive that any other body, except one constituted as the Tyne Commissioners are, could have done such a thing.

Cross-examined by Mr. Webster.

2796. You think very highly of the Hay Hole Dock?—Yes.

2797. I believe the larger portion of the staiths are the property of his Grace the Duke of Northumberland?—Yes.

2798. What proportion are so?—The whole of them.

2799. (*Mr. Seymour.*) We have heard something about carrying out the Hay Hole staiths to Mr. Rennie's line. Supposing the staiths and quays at Hay Hole Dock were extended to Mr. Rennie's line, and you added to it also the charges for affording railway approaches, can you give the Commissioners any opinion of the amount of cost which it would involve?—The expense of constructing the shipping-places at Hay Hole is about 9*l.* a foot; therefore if the number of feet required to be projected is stated, you can get the amount. I think I was once asked the question before, and I came to the conclusion that it was 50,000*l.* or 60,000*l.*

2800. Then supposing Mr. Rennie's plan had been carried out, the staiths and quays would have cost 50,000*l.* or 60,000*l.*?—Yes.

2801. Does that include the cost for affording railway approaches?—No.

2802. Would that make a sensible addition to the cost?—A material addition to the cost.

2803. (*Mr. Webster.*) The Hay Hole Dock, or the Northumberland Dock, will give you deep water at all these staiths?—Yes.

2804. And therefore it has put an end to the question of compensation to those staiths from the silting up of the river by reason of the erection of Willington Quay?—That may be a question.

2805. You are the Mineral Agent of his Grace the Duke of Northumberland?—Yes.

2806. Have you ever had any river engineering works under your control at all?—I have not, excepting shipping-places.

2807. These results which you have given, you say, are the results of your consideration upon facts published?—Exactly; my first results are given from Mr. Rennie's data, and the others subsequently.

2808. As regards those results from Mr. Rennie's data, and those contour lines which you have referred to, you did not calculate those yourself, did you?—Yes.

2809. Did you take them from Mr. Rennie's plan yourself?—Certainly.

2810. How did you understand that Mr. Brooks only proposed to enclose 201 acres; did he tell you so?—Yes.

2811. Are those 201 acres in addition to all that is now going on?—That he must explain himself. I have explained my proposition to enclose 217 acres, and he said that he proposed to enclose 201.

2812. Are your 217 acres, which appear to coincide so nearly with Mr. Brooks' 201 acres, in addition to the abstraction of Jarrow Slake and the Northumberland or Hay Hole Dock?—Yes.

2813. And Palmer's encroachment and the encroachments of the Corporation from Jarrow to Hebburn quay?—They are in addition to Jarrow Slake.

2814. What was your calculation of the enclosure of Jarrow Slake?—360 acres, with a mean depth of 4½ feet, I think at high spring tides; at dead neaps, nothing.

2815. You were examined upon the Jarrow Slake Bill, I think?—I was.

2816. And you advocated that on the same principle, I presume, as you have now advocated the shutting up of Coble Dean, that it was an inlet which interfered with the direct course of the current?—Exactly.

2817. With respect to the range up at Stella, what lift of tide do you assume in your calculation?—The same as now at springs, and at dead neaps 18 inches. I assume to lower the bed; I do not profess to say that the high-water level of the river will be increased at all materially; it may be increased a little, but what I rely upon is the acquisition of tidal water by the lowering of the bed in that district of the river.

T. J. Taylor, Esq.

29th January 1855.

2818. You say that at Stella there is this deep inlet which makes the bed at Stella as low as the bar?—There is no deep inlet.

2819. Is not the bed at Stella as low as the bar?—Lower than the bar.

2820. Is there a considerable bend of the river at Stella?—A winding of the river.

2821. If Mr. Brooks should pursue the same policy as he has done in the Tees, by cutting off that bend and making it straight, you would lose the benefit of it?—I hope Mr. Brooks will not do so.

2822. It is essential to your theory that this double bend at Stella, analogous to what there was in the Tees, should not be cut off, but retained?—Not at all, because if you were to bring a straight cut through that same space, you could not retain that depth of water in that case without making full-tide walls above the highest reach of the tidal or other current.

2823. Do you agree with Mr. Brooks, or what is your opinion as to the expediency or inexpediency of cutting off White Hill Point?—I say generally that if you cut off points in a river it does good.

2824. This is not the first time you have been examined upon this point; what is your opinion as to the expediency or inexpediency of cutting off White Hill Point to the extent of 200 feet within the Mr. Rennie's line?—I think it would do good to the river. At the same time I may say that I think it would injure the water at South Shields very materially.

2825. Do you agree with Mr. Brooks in thinking that, supposing White Hill Point were cut off 200 feet, you must then have something like docks, as proposed at South Shields, to preserve the line of the current?—Yes; otherwise you have a shoal extending perhaps 200 to 300 feet at a point where there is at present deep water at South Shields.

2826. What is the point up the Tyne above bridge which you consider the limit of the tidal range?—About a mile above Ryton.

2827. You have given us various calculations as to the quantity of water produced by the rainfall, which you suppose comes down through Tyne bridge; are you aware of any observations of the actual quantity?—I have observed it myself.

2828. Have you made precise observations by tide gauges and other things?—I have tried the velocity and observed the depth; I have made a calculation of the quantity of water discharged; I had a special object in view, contrasting the greatest amount of discharge from the Tyne with the least amount of discharge from the Tyne.

2829. The information you have given us to-day has been merely upon the area of rainfall?—By no means; I did actually measure the quantity of water discharged.

2830. Where?—At Newburn Quay.

2831. Did you compare that with the quantity going through the bridge at Newcastle in the same flood?—Certainly. The velocities were observed by me, and the depths also, and I made as close a calculation as I possibly could; my object being at the time to contrast the highest discharge of the flood waters with the lowest summer discharge of the Tyne.

2832. Is the book of 1851 dedicated to his Grace the Duke of Northumberland?—Yes.

2833. I observe that in treating of the river Tyne in that book, you leave White Hill Point untouched?—I have explained that.

Re-examined by Mr. Seymour.

2834. Was that cut to which you have referred Mr. Rendel's plan or Mr. Brooks'?—It was Mr. Rendel's plan.

2835. (*Captain Fitzroy.*) I should like to be clear upon one point. Your proposed alterations, supposing them carried out, would affect a part of the bed of the river, which is now as low, or nearly as low, as the bar?—I pointed that out upon the section of the river as a proof of the capabilities of the river; and that if the intermediate shoals were removed from that point down to Tyne bar, there really is no reason why we should not have a very good depth of water throughout the whole of the intermediate space.

2836. (*Mr. Armstrong.*) I did not understand you to propose any alteration in that part of the river?—I propose the carrying out of a certain system of river lines upon the general principle, which I have already explained.

2837. (*Captain Fitzroy.*) Unless there be some alteration, there can be no compensation for the shutting out of tidal water from Jarrow Slake; there must be some alteration?—The compensation which I have proposed consists of the several improvements which I have mentioned before. First, the reduction of the low-water surface, by removing the silt upon the present bed of the river, by means of works constructed for that purpose.

2838. If the low-water surface be reduced below that which it now is, so that it will be as low as the bar, how can any increase of tidal water be admitted, because that space below the low-water level, if hollowed out, will be filled and remain filled with water from above?—The intervening space is not below the level of the bar; the intervening space is considerably above the level of the bar. From that point downwards towards the bar there is a very great deposit of silt above the level of the bar; my object is to have that silt removed by the construction of proper works upon the river, and so to make a new tidal basin in substitution of that which is supposed to be abstracted.

2839. Then your proposition is not, as I understood it before, to alter the bed of the

T. J. Taylor, Esq.
29th January 1855.

river where it is already as low as the bar, but you propose to clear away the bed of another part of the river, which is higher than the bar?—Exactly. I should be quite satisfied with having the whole river bed reduced down to the level of the bar; but it is in contemplation, by means of piers, to reduce even the level of the bar perhaps 5 or 6 feet. If that level of the bar is reduced 5 or 6 feet, then it follows that there may be a probability, perhaps only a possibility, of reducing also the entire upper portion of the river to a still lower level, or at all events to the level of the present bar.

2840. Must not that depend upon the low-water level at the entrance of the river, not the depth of the entrance of the river itself, because the body of water will not fall below the low-water level?—It will certainly not fall below the low-water level.

2841. The object of my question applies particularly to the fact that in considering the propriety of altering the bed of the river anywhere within, it must always be borne in mind that for the purpose of giving a better passage for tidal water, you cannot excavate below the low-water level with any advantage; you may clear away down to the low-water level, but below that, if you went ever so deep, it would only remain a pit for water?—I do not know that. As a matter of argument, these spaces really are operated upon by the currents of the river, for this obvious reason, that they would be filled up, unless they were operated upon by these currents. But irrespectively of that, I am satisfied with the depth in that portion of the river, which is now below or at the level of the bar; what I want is to remove, by the construction of proper works, the intermediate mass of silt which lies between that portion of the tidal basin and the bar.

2842. Are any of those spaces to which we have been referring as below the low-water level, ever without water?—They are not below the low-water level.

2843. I am speaking of those below the low-water level. You have referred to certain excavations below the low-water level, are those holes up to the low-water level always filled with something, either water or mud?—With water.

2844. Then, if they are always filled with water, how can they admit any addition of tidal water?—I do not calculate upon any additional section of that particular portion of the river, but I speak as to the portion intervening between there and the lower parts of the tidal basin. I can point out another portion of the river which, perhaps, is not more than two or three miles from that, where there is no such section; here the sand in the river lies, perhaps, 10 or 12 feet above the bar level; now I want that shoal removed; and generally I should be satisfied if the intervening shoals were removed.

2845. (*Mr. Brunel.*) Do you really contemplate that by any of these improvements, you will be ever likely to get the bed of the river generally above Newcastle, and from there to Leamington, below the level of the present bar?—No; I should be satisfied if we got it down generally to the level of the present bar; and with a view to the future bar, we should then have the bed at a considerable elevation above that bar.

2846. And you would hope to get it down again to the future bar?—A further reduction of the bed might, I think, be made.

2847. Do you contemplate the probability of your being able to get the bed of the river, from Newcastle Bridge to Leamington, down throughout to the level of the present bar?—Certainly; I have no doubt of it, with the construction of proper works, and the deepening of the outfall, which will be occasioned by the construction of the piers.

2848. With respect to the amount of fresh water that falls, have you made a calculation, comparing it with the amount of tidal water which now flows in?—Yes.

2849. Is it not about one tenth?—The amount of fresh water, I think, I stated at 1,309,000,000 cubic yards in the year; that is discharged in six, seven, or eight floods.

2850. The average would be somewhere about 3,600,000 yards a day, would it not?—I suppose about that.

2851. What is the total average of the tidal water?—In spring tides about 26 or 27 millions cubic yards.

2852. Is it not more in spring tides?—No, not allowing for the deficiency of the tidal section.

2853. Does not Mr. Rendel make it considerably more than you do?—I think not. I am going upon Mr. Rennie's calculation; it is not a correct calculation, because he did not allow for the deficiency of tidal water in the upper portion of the basin.

2854. Does not Mr. Rendel make the tidal amount about 720,000,000 feet?—It is about 26,000,000 cubic yards.

2855. That is each tide?—Each tide.

2856. That is 52,000,000 a day?—Yes, in spring tides; in neap tides, of course, very much less.

2857. Probably 40,000,000 on the average?—Rather less than that, I should say.

2858. Therefore three-fourths would be the mean?—Yes; the upper part of the river in dead neaps does not carry more than about 18 inches; in spring tides it flows about 7 feet.

2859. Instead of 40 millions, we will say 38 millions, and the land water will be about 3,600,000?—Yes.

2860. Therefore it is between one-tenth and one-eleventh?—Yes, calculating it in that way; but if you consider that the quantity of flood water is discharged in 8 or 10 floods in the year, it makes a great difference, and involves, in fact, the whole question.

2861. (*Mr. Seymour, through the Chairman.*) May not the moving tidal column act with greater power in passing through a channel with a greater depth at low water, than through a channel with little water at low water?—Certainly.

2862. (*Mr. Brunel.*) The same quantity, or the same velocity?—The same quantity of tidal water in a deeper section has greater power than in a shoaler section. *T. J. Taylor, Esq.*

2863. Will not it go slower?—Faster, because the resistance in the deeper section is less. 29th January 1855.

Mr. JOHN FRANCIS URE, sworn.

Examined by Mr. Seymour.

2864. I BELIEVE you are the engineer of the River Clyde?—The resident engineer. *Mr. John F. Ure.*

2865. Were you previously one of Mr. Rendel's principal assistants?—I was for 4 or 5 years.

2866. Has your attention been for some time directed to the Tyne?—Previously to this Inquiry, not otherwise than as one of Mr. Rendel's assistants.

2867. Did you visit the Tyne in 1849 for purposes connected with the Tyne Navigation Inquiry?—I only did it for Mr. Rendel; the survey was by Mr. Rendel himself.

2868. You came here, I believe, about a week ago?—Yes.

2869. At whose instance did you come?—At the request of the Tyne Commissioners and of Mr. Lindsay, M.P.

2870. Since you came, have you examined the condition of the works down the river, and taken some soundings upon it?—Yes, generally.

2871. How many inspections have you made?—I went down twice, once by myself, and once with the Royal Commissioners.

2872. Did you make an examination at Hebburn, and Jarrow, and other places where shoals were pointed out as having previously existed?—The evidence that was given on the Jarrow Dock Bill was put into my hands, and I read it carefully over, and it appeared to me that the only two points of deterioration in the navigation, which were alleged in that evidence, were one case at Jarrow, and another case of the section at the bar; and in forming an opinion upon a work of this kind, I examined into the state of the shoal at Jarrow, and into the condition of the bar. The shoal at Jarrow I found to have about 18 feet 9 inches at high water; it has 5 feet, or 5 feet 3 inches at low water, a little less than is shown upon Mr. Comrie's survey. After that I went into the calculation of the section at the bar, because I considered that if the section at the bar had been at all diminished by any of the works executed in the navigation, it would show that those works were not of a kind calculated to maintain the bar, upon which the existence of the trade of the River Tyne materially depends. I may state to the Commissioners the surveys that I calculated the state of the bar from: The first was Mr. Rennie's, of 1813. That gave the sectional area of the bar from the 3 feet deep water line upon the south shore at low water, to the 3 feet line of low water upon the north shore, as 10,567 square feet; and the length of the crest of the bar between the 6 feet depths at low water, was 1,050 feet, having two interruptions of 5 feet 6 each. The next survey that I tested the bar from was a published Admiralty survey of 1838 by Mr. Slater; but, as I do not know what low water datum that survey is referred to, this calculation is not of so much importance; it makes the area 11,018 square feet between the lines of 3 feet depth at low water, the length of the crest of the bar between the 6 feet lines in that case being 900 feet. The next survey that I calculated from was Mr. Calver's survey of 1849. That survey gave the area of the bar 9,984 feet, and the crest between the 6 feet lines at low water about 700 feet in width. The depth of the bar shown upon that survey is 6 feet 8 inches at low water; but some of the depths that are included in this area, going over the Spar Hawk Bank, are less than the 18 feet below high water. Then I took Mr. Comrie's survey of 1854. That survey gives an area upon the bar of 12,050 square feet, the depth on the bar 7 feet 3 inches, and the width of the crest between the 6 feet lines 1,100 feet; so that if you compare the survey of Mr. Comrie, of 1854, with that of Mr. Rennie of 1813, you will find that the bar between the 6 feet lines is about the same width, that is, about 1,000 to 1,100 feet; but that in the survey of Mr. Comrie you have got a 7 feet 3 depth over the bar, while in Mr. Rennie's you have only a 6 feet with two interruptions of 5 feet 6 inches. So that, so far as it is a question of the two surveys of 1813 and 1854, I think there can be no question that the bar has materially improved.

2873. Are you able to give your opinion with reference to the places in the river which were pointed out to you as the places where shoals had previously existed?—As I was going down the river, I took soundings over the places where shoals, it was asserted, had formerly existed, and the least depth upon any of those places was 17 feet 3 inches.

2874. Do you recollect Tyne Main?—Yes.

2875. Hebburn?—Yes,

2876. And Jarrow?—Yes.

2877. And Ellison Main?—Yes.

2878. Forming your opinion upon those results, compared with the previous surveys, in your opinion, both as to depth and in general, is the navigation of the river better?—Judging from Mr. Comrie's surveys, as they have been reduced and marked upon the map which has been handed in to this Commission by Mr. Brooks, I think there can be no question that the navigation has improved as a sailing channel, both in regard to depth and straightness.

2879. I presume you consider the deepening of the bar a matter of very great importance?—I should consider it of the first importance.

Mr. John F. Ure.

29th January 1855.

2880. In your opinion, which is the most advisable course, commencing at the bar and going up the river, or the contrary, looking to the result upon the bar itself?—I should say, as a rule, in carrying out works of that kind, you would naturally attack that first which was most in your way; but as a principle, I should prefer commencing at the top of the river and carrying the works down it, because the jetties which are run out, and other works formed in the upper part of the navigation, set the sand in motion, and it goes further down, and when you come to execute the works lower down, these have a tendency again still further to force the sand down; whereas if you start with the works at the lower part, no doubt you set the sand in motion at that part, but when you come to construct the works above, it is very possible there would not be the same clearance of sand effected out of the channel, because the lower works previously established had already done their work. I would say, having reference to the large mass of sand, amounting to about two and a half millions of yards that have been moved out of the channel of the river, (I have not been able to make a very exact calculation of it, but taking it roughly, that is an approximate calculation,) that if you put such an enormous quantity of sand as that in motion, it cannot be done without producing temporary inconveniences.

2881. Do you think it an important matter to train the navigation above in the river, with a view to improve the navigation below?—There can be no doubt that the further up you send the tidal wave or the volume of water, the greater the beneficial effect upon the lower portion.

2882. Is it an improvement, in your opinion, to lead the currents of flood and ebb in the same channel?—Yes.

2883. With regard to the relative merits of full-tide walls and jetties, as compared with half-tide walls, what is your opinion?—My opinion generally is in favour of full-tide walls, because, where they have been erected, it has been found that the most beneficial results have ensued.

2884. Will you state the result of the practice which has been pursued in the Clyde?—Originally the improvements were commenced by making full-tide jetties, about the year 1770. I should first mention that the depth at Glasgow at high water of neap tides was about a foot or 15 inches, and at spring tide about 3 feet or 3 feet 6. When Mr. Golborne was called in, he advised the construction of jetties, and in the course of 10 years their operation lowered the bed of the river to an extent that enabled as much as 7 feet water to be got to Glasgow. After that, Mr. Golborne was further asked how to get more water, and he said that the best way to get more water was by lengthening the jetties still further, and by increasing their height so as to direct the current of floods better through them; formerly the floods had gone over the top of them. About 1800, Mr. Rennie advised the joining of the ends of these jetties by training walls, and that was found to produce a considerable benefit, and about 1821, after Mr. Rennie's death, when the trustees wanted a still deeper river, they completed these half-tide to full-tide walls, and the effect, was beneficial. The present depth of the bed of the river at Glasgow is about 16 to 18 feet lower than it used to be. I may add that the column of tide at Glasgow is now about 6 feet 6 to 7 feet at neap tides, where formerly there were no neap tides at all, and now the spring tide is about 8 feet 6 inches, where it used to be 18 inches; at all events it is so stated in Mr. Smeaton's report of 1755.

2885. As regards the passage of ships over the bar, supposing the River Tyne to be improved in the same way as the Clyde, which do you think is most interested in that question, Newcastle or Shields?—I should think the interest of both equally important, because with a deep river up to Newcastle, of course, as large vessels would get up to Newcastle as to Shields, and as those vessels would most likely require to leave about high water, or a little before high water, they could not get over the bar till perhaps the tide had gone down an hour or two hours, and the reverse in arriving; for in order to arrive at Newcastle the same tide, the vessel crossed the bar, it would require to do so before high water, otherwise if deep laden, it would be grounded in its passage up the river; so that I should say on the whole the interest of Newcastle would be quite as strong in maintaining the bar as the interest of Shields.

Cross-examined by Mr. Webster.

2886. You say Newcastle is as much interested in maintaining a deep bar as Shields. I apprehend that a mere height of bar, equal to the depth of water at Newcastle, would be sufficient for the Newcastle people?—No. Do you mean in reference to the present depth at Newcastle?

2887. You say that the Newcastle people are as much interested in a good bar as the Shields people. I ask you whether, assuming that the depth of water up to Newcastle is 21 feet at high-water spring tides, it is not quite sufficient for them that they should have 21 feet on the bar?—No. If you have 21 feet up to Newcastle, then you must have more than 21 feet upon the bar; because, supposing a vessel draws 20 or 19 feet, and she leaves Newcastle upon the top of the tide, the tide has gone two hours before the vessel gets to the bar, so that you must take that into your calculation. That, perhaps, would make 4 feet of height of the tide.

2888. Who is consulting engineer of the Clyde?—Mr. Walker.

2889. Then, I suppose, you consult with Mr. Walker?—Yes.

2890. Which of the Commissioners applied to you to come here?—Mr. Cowen, the Chairman.

2891. When did he apply to you?—I should think about a fortnight or three weeks ago.

2892. And when did you come here?—On Friday last.

2893. So that the information which you have given has been obtained since Friday last?—The principal information which I have given has been from the plans.

2894. In the calculations which you have given of the sectional areas of the bar, have you included in each case the Spar Hawk channel?—I have included the Spar Hawk channel where the Spar Hawk channel was shown upon the section.

2895. With respect to the Clyde, am I to understand you to say that, looking to the different descriptions of harbours and rivers, the Clyde is at all an analogous case to the Tyne?—There is a considerable resemblance between the Tyne and the Clyde, if you except the bar.

2896. I believe the Clyde is not a bar river?—No.

2897. Has not the great object on the Clyde been to make it a deep still-water canal up to Glasgow?—No doubt the great object has been to make deep water up to Glasgow.

2898. What was the original width of the Clyde when Mr. Goulburn began to operate upon it?—In the reports given of that date several widths are mentioned. 600 and 800 feet, at which it was reduced by these jetties to about 150 to 200 feet.

2899. Was not that found too narrow in width?—It was found sufficient for vessels trading to it at the time, but now with the larger vessels which trade on the river, the largest upwards of 2,000 tons, it is found much too narrow.

2900. Do you know how much money has been expended upon the Clyde?—Taking everything into account, cost of works, interest on money, purchase of land, and the whole expenses, it is about two and a quarter millions; but that is over a period of 80 or 90 years.

2901. You said that Mr. Rennie found that considerable benefit resulted from joining by walls the ends of these jetties; what was the nature of the benefit? making a truer current?—Yes; and thereby getting deeper water.

2902. Then do these jetties make eddies, which joining them with walls removes?—Yes; such is referred to in Mr. Rennie's report of that date; there was one foot more water at the ends of the jetties than between them, and of course one of the objects of the training walls was to gain that additional foot of water.

2903. Then in causing the channel of a river containing sand to be operated upon by the current, you hold it to be good engineering to have a continuous line of wall?—Yes: as little broken as possible.

2904. You have spoken of the sectional areas of the bar; did you calculate any of the sectional areas in Shields Harbour?—Yes.

2905. Did you calculate many of them?—I did, with the assistance of a surveyor in Newcastle. I have not got the sections here, but I can give you the general result.

2906. You found the harbour decreased in width, did you not;—I did not look upon it particularly in that point of view. The point of view that I looked at it from, was the quantity of material which had been removed out of the channel of the river at that part.

2907. You said, I think, that the river showed an increased depth, but I think you also found that it showed a decreased width?—Of course, between the present river walls it is narrower than it was between the old high water shore lines.

2908. So that the sailing channel is deeper and narrower?—No; the plan shows it to be deeper and wider.

2909. Who contoured these for you?—I take the plans as they are given in evidence before the Royal Commissioners.

2910. Your information, so far as regards the sectional areas, is founded upon Mr. Comrie's repitition of his survey of 1849?—So far as the sectional areas of the sailing channel are concerned, but with reference to my statement of two and a half millions of yards of sand taken out of the present channel of the river, that is a calculation partly by myself, and partly with the assistance of a Newcastle surveyor, made from the surveys of 1813 by Mr. Rennie, and of 1854 by Mr. Comrie.

2911. Do you remember the quay at North Shields being brought before you during the time that you were with Mr. Rendel?—I do not remember it just now. I should say that any evidence which you want connected with the time while I was in Mr. Rendel's employment, I should like you to get from himself.

Re-examined by Mr. Seymour.

2912. You have been asked a question with regard to the analogy of the Clyde; do you know that Mr. Rennie refers to the Clyde as an example in favour of the plan which he lays down in his report on the Tyne?——

(*Mr. Webster.*) Of joining the jetties?

(*Mr. Seymour.*) Does he quote the example of the Clyde in favour of some of the improvements which he recommends?—Yes, he states so in his report.

2913. Do you know that Mr. Calver, of the Admiralty, also refers to the Clyde in support of his illustrations?—I have heard that.

2914. With regard to landowners, what arrangement was made with them in effecting these improvements?—All the land that was acquired from the river, at that time, was taken possession of by the landowners opposite.

Mr. John F. Ure.

29th January 1855.

2915. In consideration of making these improvements?—I presume so.

2916. (*Mr. Webster.*) Do you not know that the Clyde trustees have had to buy back a considerable portion of the land?—Yes.

2917. (*Mr. Seymour.*) What is the cost of dredging in the Clyde?—It varies a good deal, depending greatly upon the mode of deposit; but I should say, dredging and depositing upon the Clyde, such as is practised here, would not be much under a shilling a yard, measuring the embankment.

2918. (*Mr. Brunel.*) Do you draw a distinction between a yard and a ton?—Yes; I should think a ton would be one-third less than a yard.

2919. (*Captain Fitzroy.*) Is the condition of the Clyde similar to that of an estuary?—The Clyde is a river below Glasgow; the estuary commences about Dumbarton or Port Glasgow.

2920. The Clyde, as a river made navigable, differs very much from a simple estuary?—Certainly, I should think so.

2921. The condition of the Tyne is that of an estuary and a river combined, is it not?—The Clyde and the Tyne are pretty much in the same condition with regard to the land waters and the tidal waters. At Newcastle there is an average rise of tide of about 9 feet, and in the Clyde at Glasgow we have about 7½ feet.

2922. Is not the Clyde more dependent upon the water that is brought down from the interior than the Tyne?—No, I should not think so.

2923. The effect, you think, of the fresh water upon the Clyde is not greater, in proportion to its size, than the effect of the fresh water upon the basin of the Tyne?—No; I should say that in the Clyde, the floods which come down, perhaps, are more prejudicial than otherwise, because it is those which bring down that immense amount of sand which deposits in Glasgow harbour, which we have to dredge; we have to dredge there about 100,000 cubic yards a year for maintenance.

2924. What is the rise of the tide at the mouth of the Clyde in ordinary spring tides?—About 9 to 10 feet.

2925. The rise of tide, at the mouth of the Tyne, being 14 feet?—14 or 15 feet.

2926. Neap tides at the mouth of the Clyde rising what?—About 8 feet.

2927. Then the difference between the neap and the spring there is only 2 feet?—Yes, and at Glasgow it is about 2 feet.

2928. (*Mr. Brunel.*) Did I rightly understand you that Mr. Comrie's soundings of 1854 give two feet more than Mr. Rennie's soundings of 1813 over the bar?—Not 2 feet; they give 1 foot 3 inches more.

2929. 1 foot 3 inches generally over the whole breadth of the bar?—Yes. In Mr. Rennie's survey of 1813, the width of the bar within the 6 feet depth was about 1,050 feet. Mr. Comrie's survey of 1854 gives 1,100 feet. In Mr. Rennie's survey there were two interruptions of about 5 feet 6 each; in Mr. Comrie's survey there was no interruption under the 6 feet.

2930. In forming your opinion of the relative position of the Clyde and the Tyne, as regards the effect of the freshes, are you acquainted at all with the quantity of fresh water which comes down in one case as compared with the other?—No.

(*Mr. Brooks.*) I now put in the plan in Messrs. Palmer's case.

Mr. W. Wake.

Mr. William Wake, sworn.

Examined by Mr. Seymour.

2931. Have you been harbour master at Shields for eight years?—I have.

2932. Comparing the present condition of the harbour with its condition in 1849, that is to say, the harbour from sea to Bill Point, what is your opinion as to its relative condition?—I consider that the harbour is very much improved, particularly in the port of Shields.

2933. With reference to the channel of the river since 1847, what do you say with regard to it?—In 1847 the bar was very bad; at present the bar is very good; there is a very great improvement indeed in the bar at the present time.

2934. With regard to the width and the depth?—A great improvement in both respects.

2935. Is the space for the berthage of ships in the harbour larger or not?—A good deal larger.

2936. In the lower part of the harbour, what is the state of the water?—The water is a good deal improved, in the lower part particularly.

2937. In South Shields?—In South Shields there is a very great improvement indeed, both as to depth and width.

2938. Since 1849, have the Commissioners increased the number and extent of the moorings in Shields Harbour?—Very much, particularly in South Shields; at North Shields they were laid down before that time principally.

2939. The money laid out there has been expended, I believe, principally in moorings?—Principally in moorings.

2940. From the harbour upwards to Bill Point, what is the condition of the sailing channel, compared with former years?—The sailing channel is very much straighter than it was, and deeper; it is not so wide.

2941. How is it with regard to sand banks?—There is not nearly so much sand to be seen at low water as there used to be.

2942. Since 1850 have you kept a regular record of the tides according to the Admiralty formula?—I have.

2943. Has it been your duty to make monthly returns to the Admiralty?—I have done so.

2944. I will ask you generally, does not the water ebb out lower at Shields now than it used to do in former years?—I think there is very little difference in that respect.

Cross-examined by Mr. Webster.

2945. Your observations on the tides which you have made, you began in 1850, I think?—No; I made some before that, but since 1850 I have done it upon the formula supplied by the Admiralty.

2946. Does it show the lift of the tides?—It shows what there is at high water and low water.

2947. You have spoken about the moorings laid down at South Shields; they are laid down from funds provided by an independent tax upon the shipping?—Yes.

2948. Quite independent of the general Conservancy fund?—It is a tax laid upon the shipping.

2949. It was a tax laid upon the shipping by the consent of the shipowners in the time of the old Corporation?—In the year 1845; some of the moorings were laid down before I was harbour-master.

2950. You have now got these moorings on the south side, and their effect has been to deepen the harbour at that part?—It has.

2951. You spoke of the bar having been very bad in 1847, and being now very good; have you known a considerable variance in the bar from time to time?—I have.

2952. To what extent?—As much as two feet.

2953. Depending, I suppose, upon the state of the freshes, and the state of the wind?—Yes.

Re-examined by Mr. Seymour.

2954. You say you have known variations; do you speak of some years back, or of lately?—I speak of 1847 and 1854; the bar was 2 feet worse in 1847 than in 1854; there is 2 feet more water upon the bar.

2955. Has the increase of depth been steady since 1847?—The last 2½ years.

2956. (*Mr. Webster, through the Chairman.*) What proportion of the number of ships that come across the bar go up to Newcastle?—A great many; but I could not say exactly the number.

2957. Out of the total tonnage that comes over, what proportion comes up to Newcastle?—That question I could not answer.

2958. (*Captain Fitzroy.*) There is a very good tide gauge at the Low Lighthouse, is there not?—There is.

2959. The results of the observations registered by that tide gauge go to the Trinity House from time to time, do they not?—They do.

2960. During the time that the observations are being recorded by the instrument, are they of any benefit to the pilots, or to any person whatever in the port?—Yes, I think they are of great advantage.

2961. While the instrument is working?—Yes.

2962. How are they used?—It is a self-registering instrument.

2963. The paper which registers these observations is upon a cylinder?—Yes.

2964. You cannot take that paper off the cylinder while the instrument is at work without interrupting the register for the time?—No, it must be stopped.

2965. You do not allow anybody to come into the Lighthouse and take that paper off the cylinder?—The tide gauge is not under my management; my remarks are from a gauge in front of my own office levelled by Mr. Comrie. There is another just above the Low Lighthouse, which was levelled by Mr. Calver.

2966. I am speaking of the perfect instrument for scientific purposes which is in the Low Lighthouse; of what use is that perfect instrument to the practical objects of every-day life, I mean the use to seamen in general frequenting the Tyne?—We can tell exactly the depth of water upon the bar by that instrument.

2967. You can tell it if you examine the instrument and take the paper off?—No; there is a dial.

2968. Where is that dial?—On the front of the lighthouse.

2969. And that dial corresponds to the gauge?—Yes; in the night time it is seen very distinctly in the harbour with a spy-glass.

2970. At what particular period does that dial refer to the state of the bar, the bar itself varying from time to time?—At the present time I suppose.

2971. Supposing a fresh were to come down the river, altering the bar in the course of 24 hours by a depth of 2 feet, giving what is called 2 feet more water than the marks, how would the tide gauge show that change?—I think it would not show any change without some change in the instrument.

2972. The ebb and flow of the tide would remain as before, but the actual position of the top of the bar would be lowered?—Certainly.

Mr. W. Wake.

29th January 1855.

2973. Then how would the tide gauge show the depth of water on the bar?—The datum of the tide gauge must be set, I believe, to the last reported state of the bar. I believe that the instrument can be adjusted to the state of the bar.

2974. Is it adjusted?—I believe so, as far as I know.

2975. Under whose charge is it?—Of the Keeper of the low Lighthouse.

2976. You are not aware, as harbour-master of Shields, how that gauge by which the shipping ought to be informed is adjusted?—No; I consider it very correct, because I have observed it by my own gauge, which I know to be well adjusted, and by observation from my office I can see it.

2977. The pilots at present make use of their own marks in the pilot code, do they not?—They do.

2978. Those marks were there probably before the memory of any of the present generation, and have been there a long time?—A long time; their marks are best known to themselves; they are not in figures.

2979. You, as harbour-master, of course understand them?—Not the marked board. I know the marks upon the rocks.

2980. Then, is the pilot establishment here entirely out of your jurisdiction? are they under the Ruler of Pilots solely, without any reference to yourself as harbour-master?—They are quite independent of me.

2981. You have nothing to do with either the tide gauge or the pilots?—I have not; the pilots are under a Ruler appointed by the Trinity House of Newcastle.

2982. (*Mr. Brunel.*) How long have you known the bar, and taken any measurements upon it yourself?—I have taken soundings at various times.

2983. How many years?—Since 1846, since I was appointed harbour-master. There was a little jealousy between the pilots and myself about my sounding the bar, and I thought it better to leave it entirely in their hands, and to have a report sent to the harbour master's office, for the public information, which I receive every time the bar is sounded. I received one about three years ago.

2984. That began in 1846 or 1847?—I commenced as harbour-master in 1846.

2985. From that time to the present, have you informed yourself in the best way you could of the depths over the bar?—I have. I sounded the bar last October, and I found then about 7 feet at a clear spring tide. I have the soundings here.

2986. Will the soundings in that book be the same as what we got from the pilots?—I have various soundings in this book, but not so recently as the pilots.

2987. Have you the depths over the bar from 1846 or 1847 to the present time?—I have not.

2988. How far up do you know the river within your duties, where do they extend to?—My duties extend from Shields up to Bill Point.

2989. And from 1846 or 1847, it has been your duty to know the state of the river up to Bill Point?—It has.

2990. In your opinion, looking to the facility of navigation from inside the bar up to Bill Point, is it generally improved, or much the same, or a little worse?—It is very much improved.

2991. From 1846 or 1847, up to the present time?—Yes. In South Shields harbour the berthage is a great deal larger than it was; within seven months of the time of the moorings being laid down in South Shields, the width increased 138 feet by measurement.

2992. Do you think that a deeper vessel than formerly would be able to go up to Bill Point?—In 1837, when I came to Newcastle, I had a cargo of linseed from the Black Sea, and I could not get a pilot to take my vessel if she drew more than 12 feet of water, and now I know vessels that draw 14 feet go to Newcastle Quay.

2993. Has there been any particular vessel, which has gone up, drawing 14 feet lately?—Yes, on the 24th of October 1854, a barque went from Shields to Newcastle drawing 15 feet water, and William Graham was the pilot; there was a rise of 15 feet that day at Shields by my gauge.

2994. Do you know of a Hamburgh barque coming up drawing 14½ feet water?—I heard of her, but I have no knowledge of it.

2995. (*Mr. Webster, through the Chairman.*) The pilot is paid by draught, is he not?—He is. In September last, a vessel came up drawing 12 feet 11 inches water at the dead of the neaps.

2996. (*Mr. Brunel.*) Do you feel positive that in 1846, or about that time, vessels drawing 12 feet water were not easily brought up?—I could not get a pilot to take a ship up in 1837 until she was lightened to 12 feet water.

2997. In 1848, should you say so?—I cannot say as to that.

2998. Do you remember the time when they began to bring up deeper vessels?—Yes, in 1848 I think it began to be better.

2999. (*Captain Fitzroy.*) Do you remember vessels having been brought up formerly drawing upwards of 14 feet water to Dent's Hole?—I cannot say. I was a long time away from the river.

3000. During 1847 and 1848 was not the river temporarily affected? had it not been bad a few years before, and did it not improve afterwards?—Yes, it improved after 1848.

3001. Those were two or three special years from temporary causes?—In 1846 the bar was very bad.

3002. Are you aware yourself whether the river was better for navigable purposes be-

tween Shields and Newcastle before the year 1846, than it was during the years 1846, 1847, and 1848?—No, I think not better.

3003. If at the Low Lighthouse the actual depth of water on the bar from time to time were shown, instead of the rise and fall of the tide, would it be practically more or less useful to the shipping passing in and out?—Not without knowing the state that the bar was in.

3004. What they want to know is the actual depth of water upon the bar, is it not?—Yes.

3005. Would there not be a simpler method of showing that, than by not only obliging them to know the rise and state of the tide, but to know how much it is better or worse than the marks? There is now a little mystery about it; they are obliged to get exactly from the pilots the state of the bar, and from the dial the rise of tide; it is a double operation?—There can be no doubt about the dial being correct.

3006. The dial shows the tide?—Yes.

3007. But it is required by a ship going out or coming in to know also the state of the bar, if she is drawing much water?—It is an advantage to them.

3008. (*Mr. Seymour, through the Chairman.*) What is the condition of Shields harbour during freshes?—Sometimes a fresh has taken almost all the ships away; it has broken the moorings.

3009. Have you had experience of occasions when a flood has produced such effects?—At different times.

3010. (*Captain Fitzroy.*) You have now from six to eight vessels in a tier in a great part of Shields harbour, have you not?—More than that.

3011. Six to nine?—Yes.

3012. Formerly, say twenty years ago, were there ever more than four or five in a tier?—Yes.

3013. How many?—We have a few more now sometimes, but sometimes they are much the same. In the lower part of the harbour we have more now. There is a greater width since the moorings were laid down, and the In-sand has gone considerably to the southward, too.

3014. Shields harbour holds more ships now than it did twenty years ago?—A great deal.

3015. How is South Shields harbour in that repect? does it hold more ships?—The greatest improvement is in South Shields, owing to the very great depth for ships lying there.

3016. Is that in consequence of any alteration in the harbour, or is it due to the laying down of more convenient moorings?—I consider that it is owing to the moorings; the ships are laid so as to affect the scour, so as to go over to the north shore.

3017. If the entrance to the river were widened, so as to admit the run of the sea more than is now the case, how many tiers of ships do you think would feel the inconvenience?—About four or five tiers up the range on the north side, but not on the south.

3018. Those three or four tiers would be in the deepest water and the best part of North Shields harbour?—Yes.

3019. Do you think that the placing of one or even two piers at the mouth of the harbour would affect the flow of the tide in any way? Supposing a pier were carried out from beyond Fryer's Creek, under Tynemouth Castle, do you think it would have any effect upon the flood tide coming in?—There is a difference of opinion about the pier; my opinion is, that upon the plan the north pier perhaps goes rather too far out, but not at all the south pier.

3020. Supposing a pier were carried out from under Tynemouth Castle, would it affect the passage of the tide into the harbour?—If it extended beyond the south pier it might, but not otherwise, I think.

3021. Do you think a south pier would affect the tide coming into the harbour?—No; I think a south pier would assist the tide coming into the harbour, if taken so far as the bar line.

3022. You do not look with anxiety to the effect of a pier carried out from the north side?—Not any; as soon as the pier was formed, it would take away the bank upon the north shore at the Lighthouse Point, which is only 430 feet wide at the Narrows.

3023. You think that the construction of piers would be in all respects an advantage, that two would be better than one?—Yes; it would make the harbour smoother.

(*Mr. Webster.*) Sir, I have been speaking with my learned friend, and he thinks that he could finish his evidence to-morrow. I have suggested to him, if he should get through his witnesses to-morrow, whether we should stop here to finish the speeches, because there is some further evidence to be given, which must be given in London, and the proceedings probably might be shortened.

(*Chairman.*) We will most readily dispense with your speeches if you think that they are not sufficiently important; it is our duty to hear all you have to say.

(*Mr. Webster.*) I do not think they can be dispensed with altogether, Sir.

(*Mr. Armstrong.*) I apprehend what Mr. Webster is proposing to us now is, that inasmuch as we have to examine evidence in London, it would be better that the Counsel on both sides should attend at that examination, and that they had better each make one speech then, which would include the whole evidence, than make one now and make a fresh speech upon the newly adduced evidence.

(*Mr. Webster.*) Yes, Sir, that is what I mean. I rather understood from my learned

Mr. W. Wake.

29th January 1855.

friend that there was a prospect of our getting through the witnesses here to-morrow. If that be so, Sir, inasmuch as there must be some evidence in London, I do not think we ought to make a speech here either of us.

(*Chairman.*) What do you say, Mr. Recorder, to that?

(*Mr. Seymour.*) My learned friend has occupied five hours in attacking my clients, and I certainly should like to be allowed to make a speech here, which I hope would not be a very long one. I do not see how it would interfere, Sir, with the general practice in these matters, or with the present case, but it would be upon the understanding that I was as short as I felt consistent with my duties, and that I was allowed to make any remarks, within of course a reasonable compass, upon any new evidence in London.

(*Mr. Armstrong.*) It does seem to me, inasmuch as a great part of Mr. Webster's speech was an attack upon the system, that it might be desirable that Mr. Seymour should make some general statement, Mr. Webster reserving his general reply until the evidence is given in London.

(*Mr. Webster.*) I have not the least objection to that.

(*Mr. Seymour.*) I should promise the Commissioners that my statement here would be as limited as possible, provided I was afterwards allowed by the Commissioners, entirely confining myself to any new evidence, to make some further observations. My learned friend has made certain charges against us, which I certainly should not like us to remain under.

(*Mr. Armstrong.*) What I would suggest, and which I think would meet the justice of the case, is, that with regard to what is to take place in summing up the evidence here, Mr. Seymour may make such general remarks as he thinks are called for by the observations which have been made by Mr. Webster, and that when he comes to London before us, and fresh evidence is given, he may sum it up, and then Mr. Webster will have a general reply; but Mr. Webster need not give any reply now.

(*Mr. Webster.*) That I am obliged for, Sir. I was only going to remind my learned friend that really the most effective part of the defence will be the evidence disproving the facts. I am quite sure my learned friend will give me the credit of perfect bonâ fide, not only to save myself, but that we may be released, if possible, to-morrow.

(*Mr. Seymour.*) Were I consulting myself solely, I would adopt my learned friend's view; but after a long consultation with my clients, who think that they ought not to be under this aspersion, I propose to conclude my case to-morrow, and to sum it up the next day.

J. Freeman.

JOSEPH FREEMAN, sworn.

Examined by Mr. Seymour.

3024. ARE you a river pilot?—Yes, and have been for 36 years.

3025. Looking to the condition of the navigable channel of the Tyne, do you think it is improved or not?—No question it has improved; it is straighter; it is not quite so broad as it used to be.

3026. Is it deeper?—It is deeper.

3027. From where to where? do you mean from the bar up to Newcastle Quay?—I have nothing to do with the bar. I speak of from White Hill Point to Newcastle Bridge.

3028. Over all the shoals; do you include the general condition of the river?—The first shoal is at Jarrow, and the last is at Tyne Main; and there is as little difference almost as possible in the shoals? not more than 5 or 6 inches difference between the shoals will be found; but they are better by a foot than I have known them the last two years back.

3029. Did you bring up the Elswick, a trader, from Shields to Newcastle?—Yes.

3030. How long since?—It is about two months ago.

3031. Was that during a neap tide?—Yes.

3032. What was the draught of that vessel?—13 feet abaft, and 12 feet 10 forward.

3033. What time was it high water that day?—It flowed at half-past 10 at Shields, and half-past 11 at Newcastle.

3034. That is about the dead of the neaps?—It is.

Cross-examined by Mr. Webster.

3035. That was a pretty good neap, was it not? within a foot of the springs, I think?—I have seen many times very little difference between the springs and the neaps.

Jacob Harrison.

JACOB HARRISON, sworn.

Examined by Mr. Seymour.

3036. ARE you a sea pilot?—Yes.

3037. How long have you been so?—Nearly 44 years.

3038. Comparing the present condition of the harbour with its condition in former years, what is your opinion as to whether it is improved or not. Do you think it improved?—It is improved, I think, near the tiers, on both the south side and the north side.

3039. (*Chairman.*) Since when?—Since the buoys were put down.

3040. Since the moorings were put down, you mean?—Yes; but very great improvements had taken place in Shields three or four years previous to putting those moorings down.

Jacob Harrison.

29th January 1855.

3041. (*Mr. Seymour.*) How far does your branch extend?—From the bar to White Hill Point.

3042. Comparing the state of the bar in its present condition with what it has been within your experience, is it improved or not?—The bar is pretty good now; a foot and a half better than the marks; a good deal better than the time that Mr. Wake was speaking about. It was very bad at that time, and had been for a long time; but years previous to that, I have known it frequently as good as it is now, and sometimes better, and sometimes worse, because the bar is a very fluctuating thing. Sometimes you will see a great alteration of it in a week, or two or three days.

3043. Is the channel easier at the Insand?—Yes; the Insand is not so far north as it used to be; but I have known it less than it is now.

3044. Do the land floods affect the bar?—Yes, a great deal, but not always.

3045. They do affect it?—Yes.

3046. Do not the land floods run very heavily in Shields harbour?—Very heavily.

3047. Did they ever send back the flood tide?—Yes, sometimes through all the flood.

Cross-examined by Mr. Webster.

3048. You say that in years previous the bar was frequently as good as it is now?—Yes.

3049. When was the bar the very best you ever knew it?—I cannot give any particular date, but I have known it as good as it is now frequently; but as to 1846, I never knew it bad so long a time, from no apparent cause whatever.

3050. Have you had any improvement at White Hill Point at all? you have had none there, I think?—We do not go so high as White Hill Point.

3051. You say that the harbour is improved on the south side where the tiers are?—Yes.

3052. Do you find, when you come to moor the ships there, that deep water comes under the ships?—Yes.

3053. The water scours under them?—Yes.

3054. And the sand goes somewhere else?—It has that effect.

3055. Do you know a place called the Middle Passage, in Shields harbour?—I never heard of it.

3056. Do you know the steam ferry track?—Yes.

3057. There is a sand there called the Durtwick Sand, is there not?—Yes.

3058. Do you remember that steam ferry getting aground there?—Sometimes there are five or six ships outside those buoys. Then if the Durtwick Sand had been there, the steam ferry would not have gone there at all.

3059. The ships have gone to another part of the harbour?—Yes.

3060. Is there sand on the line of the steam ferry?—On the north of the line of the steam ferry.

3061. What does the steam ferry draw?—Three or four feet.

3062. Does she occasionally get on that sand?—I have heard tell of it, but I never saw it.

3063. (*Captain Fitzroy*). What material is the bar made of? From the inside to the outer side is it sand throughout, or are there some patches of hard ground?—It is all sand throughout.

3064. Right through, from one side to the other?—Yes.

3065. Supposing it were attempted to dredge it out, how much do you suppose it could be deepened?—If they deepened the bar 5 or 6 feet in a week, I think it would come up again in a fortnight.

3066. You think there are some feet of sand?—Yes.

3067. As much as 3 feet of sand?—Yes. I have known that sometimes the bar has not been much better than the marks, but at very short intervals it has changed in depth.

3068. What width may it be from the Black Middens across—from where the rocks begin to the south?—I think they go about half way across the river. There is plenty of water there, and of course we do not measure those different things—they do not lie in our way.

3069. You might deepen the bar to half a cable's width right across?—I dare say you might.

3070. Could you do so to a cable's length in width?—Yes, I should say so, by scouring it.

3071. For that width right across the bar?—From the Herd end to the rocks.

3072. What is under the Spar Hawk?—It is nothing but sand.

3073. Soft?—Yes. I have known the bar bad except the Spar Hawk, and the channel has laid right over the Spar Hawk.

3074. Do you think that there is any rock under it?—There is no rock there.

(*Mr. Seymour.*) I have to apply for a summons, Sir, for Mr. Thomas Salmon, the town clerk of South Shields.

(*Chairman.*) The Secretary will give it to you immediately.

Adjourned till to-morrow, at 10 o'clock.

30th January 1855.

Tuesday, 30th January 1855.

(*Mr. Webster*). Perhaps it will be convenient to my learned friend, Sir, to put in the correspondence upon the piers, because we may want to ask Mr. Brooks a few questions upon it, and it might delay us otherwise.

(*Chairman.*) There is no objection to that, I suppose?

(*Mr. Seymour.*) I propose calling Mr. Clayton early to-day, and I think it will be more in course for him to put it in then. My learned friend will scarcely have an opportunity of looking at it till then.

(*Mr. Webster.*) Perhaps it would be better to call Mr. Clayton at once.

(*Mr. Clayton.*) There are two or three short witnesses, and then I will produce it.

(*Chairman.*) I may mention that we settled last night, that if it is possible, we will examine Mr. Stephenson and Mr. Rendel in London on Thursday week, if that day will suit them, or if not, some other day, either Wednesday, Thursday, Friday, or Saturday of next week.

(*Mr. Webster.*) That is quite convenient to me, Sir.

(*Mr. Seymour.*) I hope, as the Commissioners propose examining Mr. Robert Stephenson, they will examine Sir William Cubitt also.

(*Mr. Armstrong.*) At present we have not determined upon examining anybody except those two gentlemen. We have Sir William Cubitt's evidence before us. We shall avail ourselves of all the information which we can get from the printed books at all the Inquiries with reference to this matter.

(*Mr Webster.*) There is nothing like following an example. If my learned friend is anxious for Sir William Cubitt, I should be anxious to have Mr. David Stephenson examined, who has had great experience upon this river.

Mr. John F. Ure.

Mr. John Francis Ure, further examined by Mr. Seymour.

3075. Are a good number of the manufacturing establishments of Glasgow built on ground reclaimed from the river?—Yes; some of the most important and most successful of them are.

3076. You said yesterday, that the total expenditure by the Clyde trustees was under 2,500,000*l.*?—Yes; about 2,250,000*l.* to 1854.

3077. I understand that the bonded debt is about 800,000*l.*?—Thereabouts.

3078. What proportion has been paid for land?—About 510,000*l.*

3079. And for harbour works?—In round figures about 480,000*l.*; and for river works, including dredging plant, 330,000*l.*, making the total expenditure upon works about 810,000*l.*

3080. Is dredging required to maintain the river?—Not to maintain the river. Where the parallel dykes are well formed, and there is no interruption to them, no dredging is required to maintain the river. On the contrary, the river has a tendency to deepen itself, and excepting where there are hard bars across it, such as gravel beds or hard clay, or something of that kind, the river has a tendency to deepen itself; and I should say that within the last fifteen years, where these parallel dykes are well formed, it has deepened itself to the extent of nearly three feet. The whole dredging that we require in the Clyde for maintenance is to maintain the harbour. It may be stated as being at the foot of a mountain torrent, and in passing through it, the water gets still; the velocity in times of floods, I think, does not exceed two miles an hour, and in consequence the large deposit, amounting to about 100,000 cubic yards a year. That requires to be removed for maintenance in the harbour, and nothing more where the dykes are well formed. In the lower part of the river, where they are broken and not well formed, a trifle is required, but not much. I should say that I believe the trade of the river is one of the principal sources for increasing its depth; as the traffic goes along, it tears up the bottom; that is especially noticed with the steam-boats at low water: and as we have a seven hours' ebb and a five hours' flood, the tendency always is to throw the raised material further and further down till it gets where it passes between or over the dykes and deposits in the ground between them and the foreshore, or is carried to the banks or deep water below, where it settles.

3081. Do the heavy floods pass over the low lands, or go down the centre of the river?—The heavy floods are not now nearly so bad as they were. Formerly it would probably take nearly a week before a flood went away; it goes away now in a day, and it does not rise now, I should think, within 6 or 8 feet of what it formerly did; the heaviest of them never cover the quays; they get up to about the top of the quays; formerly they rose on the quays 6 or 8 feet, and drowned some portion of the town.

3082. Do they go over the low lands?—Partially, but not much.

3083. You stated yesterday that 2,500,000 yards of sand were removed between the jetties since 1813 in the Tyne; can you state the division of that?—I stated yesterday that

Mr. John F. Ure.

30th January 1855.

I made a rough calculation of the quantity of material removed out of the Tyne, between the walls that are now building, since 1813; the quantity I stated about 2,500,000 cubic yards; that calculation made the exact quantity 2,698,000. I stated yesterday at the same time that the calculation was a rough one, and before taking the figures as being exact, if the Commissioners attach any importance to them, it would be as well to have them properly checked. The divisions are these: from Newcastle Bridge to St. Anthony's Quay, there have been moved out of the channel 260,000 cubic yards; from St. Anthony's to Hebburn Quay, 290,000 cubic yards; from Hebburn Quay to Howdon Dry Dock, 810,000 cubic yards; from Howdon Dry Dock to the west end of Jarrow Slake, 98,000 cubic yards; from the east to the west end of Jarrow Slake, 290,000 cubic yards; through Shields Harbour, that is, from Jarrow Slake to the Narrows, 950,000 cubic yards; making a total of 2,698,000 cubic yards.

3084. (*Captain Fitzroy.*) From what source are those quantities obtained?—From the plans of 1813 and 1854, as surveyed by Mr. Comrie.

3085. Calculated by whom?—Mr. Bell, a surveyor in Newcastle, took out most of the quantities, and after he had taken out the areas of the sections, I made all the other calculations myself.

3086. (*Mr. Seymour.*) With regard to the management of the business in the Clyde, do you manage your business by committees?—There is no other way in which it can be done.

Cross-examined by Mr. Webster.

3087. I suppose that everything depends on the way in which those Committees are constituted and conducted, and their reports are dealt with by the general body?—Under general circumstances everything that is to be done is first brought before the Committee; and at the monthly meetings of the trustees the reports of the Committee are read in full.

3088. The fact is, that your Committees keep very accurate records of all their proceedings, and those are confirmed from time to time by the general meeting?—Yes.

3089. What is the nature of the constitution for the government of the Clyde?—It is elected from the Town Council and from the Chamber of Commerce, and from the Trades House, and the magistrates of Glasgow are all trustees ex officio.

3090. In fact it is a representative body, is it not?—It is.

3091. Of how many does it consist?—Thirty-three.

3092. These quantities, which you have given us as being obtained from the river bed, are calculated, as I understand you, from what appears upon Mr. Rennie's plan and what appears upon Mr. Comrie's survey?—Unquestionably.

3093. That is Mr. Rendel's chart of the river, with Mr. Comrie's soundings upon it?—Yes; Mr. Rendel's plan of 1849, with Mr. Comrie's recent soundings of 1854 upon it.

3094. Then the calculations which you have now given are a comparison of Rennie with Comrie of 1854?—Of Rennie of 1813 with Comrie, of 1854.

3095. Have you at all been able to estimate in that the quantity of soil that has been disturbed by dredging?—No; the quantity of soil that has been removed by dredging, as compared with this quantity, must be trifling, because of the small quantity that a dredger can put out.

3096. I apprehend that the operation of a dredger is to equalize the surface: that the system of dredging which has been pursued in the Tyne is to take off the more prominent points, and then the current will do a good deal besides, will not it, in equalizing?—The current will level down. If you mean that the dredger in working over the ground leaves ridges, and the current levels those ridges, that is perfectly correct.

3097. I mean a good deal more than that. Take the case of the Tyne main shoal; that was a very hard surface, which was to hold up the sand above it?—If the Tyne main shoal, or any other part of the river, is hard, and you dredge through that hard part and it is soft below, the current of the river might remove the soft part.

3098. So that in point of fact, a little dredging properly done, in taking off the hard parts, with a proper system of training, would so equalize the bed of the river that it might produce very great results?—Not a very little dredging. It would require a good deal of dredging to do it properly.

3099. You have said that the trading vessels on the river Clyde is one of the principal sources for increasing its depth?—I think so.

3100. Are steamers very powerful agents in disturbing the sand and all soft materials?—Yes.

3101. Then is the operation of the steamers constantly going up and down, that they act as a sort of partial dredging, and the current removes the matter so disturbed?—Yes.

3102. I believe the effect of that in the Clyde is very great indeed?—I stated that where the parallel walls are properly formed it has deepened the bed of the Clyde about three feet in 15 or 16 years.

3103. But for it to be carried out properly you must have as the basis of the operation, so to speak, proper training walls?—Yes; there are some places where there are not proper training walls, where no increase has taken place in the low water capacity of the channel above what has been made by the dredging machine.

3104. Of course if you have a good training wall, the line of the current will be maintained pretty well, although you may have occasional intervals?—No.

Mr. John F. Ure.

30th January 1855.

3105. Then you think it essential that you should have a uniform training wall?—Yes; because if you have any back water, the tendency of that back water in flowing into the main channel of the river is to cause a cross current, and to make a deposit below, and those are the only circumstances under which you find that shoals are formed in the Clyde. The current of the river is so strong that they do not form to any great extent.

3106. So that an opening in a wall will have a tendency (whatever its actual result may be, depending upon other circumstances) to produce a shoal?—Yes.

(*Mr. Armstrong.*) An opening in a wall which lets in a current of water?

(*Mr. Webster.*) Exactly so, Sir.

3107. (*To the Witness.*) Therefore to have a river in the most perfect state, you should have a uniform training wall throughout, with no openings?—Yes.

3108. As regards the effect of vessels, in addition to the operation of the paddles of the steam boats as acting to a certain extent as dredgers, is not the mooring of vessels, and the number of them moored, also a powerful agent in deepening the channel?—Yes, where you have a velocity in the water.

3109. At Shields Harbour, where the number of vessels and the tiers have been very much increased of late years, that would lead to a deepening of the harbour in the neighbourhood of those vessels?—I expect so.

3110. You spoke about the floods. Has there not been generally throughout the country a considerable diminution in the magnitude of the floods?—No; I should think that as a rule no alteration has been made; the magnitude of floods should rather have increased; because the better you drain the land, the more quickly you bring the flood water off, and consequently the quantity of water that is passed through a given channel in a given time must be increased; that is found to be the case in the Clyde.

3111. Most rivers in the country have been improved?—A good many; not all.

3112. The Tyne, for instance?—I think a good deal has been done upon the Tyne.

3113. Has it been very much improved?—You cannot say it has been very much improved, because they have not had time to do very much to it.

3114. Then does your notion of improvement commence with 1850?—I have not formed any notion of the dates of improvement, because I have not gone into the history of it; it has commenced and gone on simultaneously with the carrying out of the works which are in progress.

3115. If you have formed no notion of the dates of improvement, how came you to say just now that they had not had time to do it?—I have heard a great deal of discussion in this room; that is the data as to time upon which I formed any opinion.

3116. As regards the question of floods and of improved drainage, has not the tendency of things been this: to impound the water for waterworks purposes, and also to improve the drainage, so much that water is either impounded or carried off to sea almost as soon as it falls?—Drainage, of course, brings the water more quickly into the channel of the river—into the main drain of the country.

3117. Do you mean to say that in the Tyne, for instance, or in any river, they have floods at all of the same magnitude that they had 50 years ago?—I should think they would have. There may be some exceptional cases; there may be some particular case in which, 50 years ago, they might have had an extraordinary flood, and there may be another case in which 50 years hence they may have an extraordinary flood; but I should say as a rule, the quantity of water that passes down the Tyne now in a given time during floods must be greater than it was 50 years ago.

3118. Then when you say that the floods have increased, you mean that there is more land water passing down the Tyne now than there used to be?—In a given time in the height of a flood?

3119. Throughout the year?—I should think it is pretty much the same; I do not happen to know it.

3120. If the tendency of drainage is to remove the water from the surface and take it down the channels, there will be less evaporation?—During times of continuous rain, which is the principal time when flood-water falls, I do not think there is much evaporation.

3121. Under the old system, the drainage was bad, and the water was retained for a long time, and then, when a great frost and an extraordinary thaw came, you had those extraordinary floods?—Yes.

3122. Does not the water now pass off, as a general rule, much more uniformly and easily than it used to do?—It passes off much more rapidly than it used to do.

3123. You spoke about these manufacturing establishments which are built on the sides of the Clyde; are they under very stringent regulations against throwing nuisances into the river?—They are not allowed to throw in anything.

3124. How is that secured, do you know? I suppose it would be a considerable advantage to them to be able to slip in a quantity of rubbish now and then?—No; they do not make much rubbish.

3125. They are too canny, I suppose, in Scotland, to make rubbish?—No; I do not know that; but the principal establishments upon the banks of the Clyde are ship-building establishments and machine establishments, and that description of establishment does not make much rubbish.

3126. Are there stringent arrangements to prevent nuisances being committed?—Yes; there are the police arrangements.

3127. Are those arrangements such, that the owners of the establishments would be pro-

ceeded against, although they might happen to be Clyde Commissioners?—There is no doubt about that. *Mr. John F. Ure.*

3128. The police arrangements and the means of preventing nuisances are such, that the fact of a person being a Commissioner would be no shield to him?—None. 30th January 1855.

Re-examined by Mr. Seymour.

3129. Are they canny enough also on the Clyde to avoid half-tide walls, and to build full-tide ones?—There are two short lengths of half-tide wall in the lower part of the river.

3130. You said that the water passes off more rapidly in the Clyde; to what do you attribute that?—To the deepening of the channel principally.

3131. To what do you attribute the deepening of the channel?—Principally to the action of the river's traffic upon its bottom. I should say also, that the channel has been gradually widened, but in some places it is not yet completely so.

3132. Has that action of the traffic been rendered more effective by the works done upon the river?—There is no doubt about that. I do not think the action of the traffic would have been much without the works.

3133. If I understand you rightly, you think that the action of the dredging also would not be effective without walls?—Of course it would not be so effective. I will give you an instance of it. Supposing, in the Tyne, that the quantity which has been removed out of it by means of jetties and of these walls, had had to be removed by means of dredging, there would have been above Shields harbour about 1,500,000 yards to remove by dredging; now the dredging machine could not have done anything like that for a great number of years.

3134. (*Mr. Webster, through the Chairman.*) I believe, in the Clyde, the works are carried on under Parliamentary powers, are they not?—Yes.

3135. That is to say, there has been a settled engineer's plan, and it has been carried out under your direction?—Yes. When the trustees went to Parliament for a plan to carry out their works, they had large quantities of land to purchase, and they could not get possession of it without Parliamentary powers.

3136. (*Mr. Armstrong.*) Then was the occasion of going to Parliament to enable them to purchase land?—It was a long time before I was connected with them, so that I can not give the exact reason.

3137. (*Mr. Seymour, through the Chairman.*) How many sets of soundings have been made in the Clyde since the first commencement of the works there?—Within the last thirty years, there have been three complete general surveys of the river made; the third one is just about finished now; but in reference to carrying out the details of the works, they have been numerous.

3138. (*Captain Fitzroy.*) I should like to take advantage of your being here to ask a question on a different branch of the subject. Referring to White Hill Point, it has a very awkward appearance, as projecting very far beyond Mr. Rennie's lines; and to any one passing up and down the river, it must at once strike him as affecting the current and the neighbourhood on each side considerably. Looking at the set of the water into South Shields harbour and the depth of South Shields harbour, on the one hand, and looking at Jarrow Slake on the other, are you of opinion that White Hill Point, taking it altogether, is advantageous to the general interests of those concerned in the navigation of the Tyne, or would it be better to reduce those staiths and diminish the point?—So far as White Hill Point itself is concerned, I think there can be no doubt, if it were simply a question of the improvement of the navigation, that it would be most desirable to have it removed; but if you take it in connexion with Shields harbour, probably it might be desirable to retain it. I should, however, think that that is a question which can only be properly solved after the Hay Hole docks, on the one side, and the Jarrow docks on the other, are completed; because you will then see the true direction of your currents, and how far it may be desirable to remove it. I should think it would be more prudent to leave the decision of that question alone till those works are completed, than to settle it now; that is the notion which I have formed.

3139. With reference to the much disputed question of enclosing or leaving open Jarrow Slake, provided an amount of banks now rising above low-water mark in the channel of the river were removed, equal to the quantity of tidal water shut out by enclosing Jarrow Slake, or a part of Jarrow Slake, would the whole navigation from Shields to Newcastle be improved or otherwise?—I think it would be very considerably improved, indeed.

Leonard Brown, sworn. *Leonard Brown.*

Examined by Mr. Seymour.

3140. Are you a down-river pilot?—Yes, from Bill Point.

3141. How long have you been in the service of the river as a pilot?—18 years.

3142. Comparing the present condition of the river with the state of it in former years, do you consider that it is for navigable purposes improved?—A great deal.

Leonard Brown.
30th January 1855.

3143. With regard to the matter of depth, what is the improvement?—Since I was first made a pilot, there is about 2½ feet more depth; from that to 2 feet 9.

3144. Where?—From Bill Point to White Hill Point.

3145. Are the shoals better?—Yes; where the shoals were when I was first made a pilot, it is removed, and the channel has much improved.

3146. What depth can you get over where those shoals were, within that range?—We have from 4½ feet to 4 feet 9: when we take a ship down, we allow 4½ feet more than the rise of the tidal water.

3147. (*Mr. Armstrong.*) Where you had what before?—We had 9 feet when I was first made a pilot.

3148. (*Mr. Seymour.*) Do you say that the channel is straighter?—A great deal.

3149. Does it vary much from Wallsend?—From Wallsend to White Hill Point you do not go more than half a point.

3150. Do you consider that that is an improvement upon the old times?—It is a great deal.

3151. On the 2d of December last, did you pilot up a ship from Pelaw—did you pilot the Bullfinch?—Yes.

3152. Where?—I piloted the Bullfinch on the 2d of December from Pelaw Main to White Hill Point, drawing 15 feet water; I believe she would be rather better; she might have been 15 feet 2; and after that she went direct to sea. The tide was flowing, I think, about half-past two, or from that to three o'clock. I cannot say to half an hour.

3153. Was that two or three days before the best tide?—It was.

Cross-examined by Mr Webster.

3154. You say that you agree with those who think a straight channel is the best; would not the navigation have been very much improved by taking off Bill Point?—I cannot say for that; it is a thing that I have nothing to do with. I do not go any further than Bill Point.

3155. Who appoints you?—The Trinity House of Newcastle.

3156. Are you a member of the Corporation of Newcastle, a freeman?—No.

3157. Although you never go above Bill Point, did you ever cast your eyes upon that point and think it would be an improvement to the straightness of the channel to be cut off?—I do not take any notice of it, because I never go there.

3158. Do not you think it would be a very great improvement to take off White Hill Point?—I do not know but what it might be; it would give a straighter course.

3159. Do you see White Hill Point marked upon that map?—Yes.

3160. What are those red things projecting beyond it, out in to the river?—I do not know.

3161. Are they not staiths; are there not some staiths at White Hill Point?—Yes.

3162. Has not his Grace the Duke of Northumberland some staiths there?—Yes.

3163. Do you see that blue line beyond the red line?—Yes.

3164. Do not you think it would be an immense improvement to the river to have it taken off to the blue line?—I cannot say. I am not an engineer.

William Story.

William Story, sworn.

Examined by Mr. Seymour.

3165. Are you a river pilot?—I am.

3166. What part of the river do you pilot on?—From Newcastle Bridge to Shields.

3167. How long have you been in that service?—17 years.

3168. Comparing the present condition of the river with its condition in former years, do you consider it improved?—Very much improved.

3169. Does that apply to the depth of water, as well as to the general condition of the channel?—Yes.

3170. Do you remember where Tyne Main shoal was?—Yes.

3171. What depth used you to have upon Tyne Main Shoal?—2½ feet when I was first made a pilot.

3172. What depth do you get there now?—About 6½ or 7 feet.

3173. Do you remember Hebburn Shoal?—Yes.

3174. What do you say about it?—At that time it was very bad, indeed.

3175. Used a number of vessels to get stranded or stuck there?—Very often.

3176. What is its condition now?—Very good.

3177. What depth do you get passing along that channel?—At high water time?

3178. Yes, spring tide?—About 16 or 16½ feet.

3179. Do you know where Killingworth Shoal was?—Yes.

3180. What was it in former times?—Much the same.

3181. What is it now?—It is very good indeed, better than Hebburn

3182. Do you remember where Howdon Shoal used to be?—Yes.

3183. How lately do you remember Howdon Shoal being in bad condition?—It was very bad about seven years ago.

3184. What depth do you get upon Howdon Shoal now at spring tides?—At high water time?

3185. Yes.—About 18 feet or 18½.

3186. Do you remember Howdon Shoal as far back as 1832 or 1833?—Yes.

3187. What depth was on it at that time?—I think there might be about four feet, that is, at low water time; there was 15 feet at high water.

3188. (*Chairman.*) And there is now 18½?—Yes.

Cross-examined by Mr. Webster.

3189. How long is it since Tyne Main Shoal was so very bad?—Seventeen years ago.

3190. Has it been getting better gradually for the last seventeen years?—Yes.

3191. Pretty steadily better, has it?—Yes.

3192. You say the river has very much improved; is the sailing channel wider?—We tow in general, we do not sail ships.

3193. You now take them down by steam?—Yes.

3194. Who appoints you?—The Trinity Board.

3195. That is, the Newcastle Trinity Board?—Yes.

3196. You have spoken about the Killingworth Shoal; how long is it since that was so bad?—It was bad about that time seventeen years ago.

3197. It has been getting better gradually ever since, has it?—Yes.

3198. Mr. Brooks has put some jetties out at Killingworth, has he not?—Yes.

3199. He has run them a good way out into the river?—No, not far.

3200. Do you know the Killingworth Staith?—Yes.

3201. Has not that come a good long way out into the river?—Yes.

3202. It has been lengthened within your memory?—Yes.

3203. How much has it been lengthened within your memory?—I cannot correctly say the distance.

3204. Is it 100 feet?—It is that, good.

3205. Is it 200 feet, do you think?—It may be.

3206. How long is it since the Howdon Shoal was so bad?—The same time, but it all generally got better during that time.

3207. You have had, I think, a considerable change in the channel; for instance, in the neighbourhood of Hay Hole, have you not a different course from what you had there?—Yes.

3208. You go by Bill Point, although your predecessor did not?—Yes.

3209. And White Hill too?—Yes.

3210. Do you think that the river would be improved by cutting off those two points?—It has been cut off.

3211. Would it improve the channel?—With the jetty which Mr. Brooks has made there, it is a considerable deal better.

3212. Has he not brought out the jetty as far as Bill Point?—No.

3213. Mr. Brooks has not cut off Bill Point, but he has brought jetties out to it, has he not?—He has cut off Bill Point too.

3214. Above water, not below water?—No.

3215. Then below water, Mr. Brooks has left Bill Point as it was seventeen years ago?—Yes.

3216. And he has brought his jetties out to it?—Yes.

3217. Can you tell me why Mr. Brooks should have brought those jetties out to Bill Point, and not cut off Bill Point?—To make the channel straighter; we had to go right in by the quay at that time.

3218. Would not the cutting off of Bill Point below the water have done just as well?—I cannot say.

3219. Do you remember a good deal of money being spent by the old Corporation in removing the surface of the soil in the neighbourhood of Bill Point?—I remember its being done, but I do not know the expense.

3220. How long ago is that?—About 11 or 12 years ago.

3221. They took away a great mound of land from above Bill Point, did not they?—Yes.

3222. But nothing has been done to take away the lower part of the earth and the rock beneath the surface of the water?—No.

3223. And you do not know why the Corporation should have left that lower part, although they removed the upper part, with this great quantity of earth upon it?—I do not know anything further than that you see the ships decidedly further in coming round than you could before.

3224. There was almost a mountain of earth taken away inland, was there not?—Yes.

3225. Do not you think it would have been a very great improvement to the sailing channel if the Corporation had taken away the rock and earth below the level of the surface of the water to as far back as they took away this earth on the top?—Yes.

3226. Perhaps you think the removal of White Hill Point would also be a great improvement if they went as far back as that blue line; you know that one of Mr. Brooks' plans was to take off White Hill Point several hundred feet within the present staiths?—Yes.

3227. Do not you think that that would have been a great improvement to the channel I cannot say that.

William Story.

30th January 1855.

3228 Would it not have been made a better channel?—It is very straight now; it is straight up and down.

Re-examined by Mr. Seymour.

3229. Was not Killingworth Shoal in a bad condition so late as 1845?—Yes.

3230. What depth of water was there at low-water spring tides at Killingworth so late as 1845?—About 2½ feet or 3 feet.

3231. Your opinion as to the lowering of the mound has been asked; has the cutting off of the mound of earth that my learned friend speaks of rendered the navigation less dangerous than it was before?—A great deal.

Mr. C. Dunn.

Mr. Charles Dunn, sworn.

Examined by Mr. Seymour.

3232. Are you a wharfinger of Newcastle?—I am.

3233. Have you been so since 1821?—I have.

3234. Comparing the present condition of the channel of the river between Newcastle and Shields with its condition in former years, do you consider that it is improved?—Very greatly.

3235. With regard to depth, what has been the increase in your opinion?—I remember formerly we have had vessels stick on Tyne Main Shoal, drawing less than 10 feet water, and now we come up with a vessel drawing 12½ at the same tide. A vessel leaving Newcastle quay to go down to Shields, had to wait for a certain flow of tide to get over Tyne Main Shoal, and before she got down as far as Shields we have had to bring up; the ebb tide has fallen so fast, that the ship could not get down to Shields; but now the shoals there are so removed, that we have no difficulty in going down from Newcastle upon one tide. The same argument applies in coming up the river; we had to lie at Shields until the tide flowed a certain height over Jarrow Shoal, and then we have been occasionally stopped at Tyne Main Shoal in coming up the river. Those obstructions have totally ceased; we can now, both up and down, navigate in one tide.

3236. Have you paid any attention to the condition of the ebb of the tide? have you made any observations whether it ebbs lower or higher?—Yes; I have occasion to pass over Tyne Bridge very repeatedly. I live in Gateshead, and I have observed the foundation of the high level bridge to be bare I think a foot and a half more than it was at the time when the bridge was built. The tide appears to me to ebb further out. I remember their pulling up the piles with a steam machine, and now they can pull them up by hand.

3237. With regard to sailing ships, has the burthen of ships that come up increased?—Yes; vessels in the London trade, to which I can speak particularly, were formerly about 200 tons burthen, and now we have them from 300 to 420.

3238. (*Chairman.*) At Newcastle quay?—Yes.

Cross-examined by Mr. Webster.

3239. You do not mean to say that they come up full loaded?—Yes, I do; and I will explain to you why. The cargoes from London are not so heavy as those which they ship from this port to London; a vessel would arrive with a cargo drawing 13 or 13½ feet, but with a cargo from here to London she would draw 16 feet, but she is laden when she comes up.

3240. Do you mean to say that you have ever loaded a ship up at Newcastle to 16 feet?—No.

3241. Is not the course of business this, to fill them up in Shields harbour?—Yes; our custom is, when it is convenient, to take in a certain part of our cargo up at Newcastle quay, to allow the draught of water for the ship to go down, and at Shields we complete our cargo.

3242. Do you know Hay Hole?—Yes, I do.

3243. That is in the borough of Tynemouth, is it not?—I believe it is.

3244. I will ask you whether as much as nine tenths of the whole tonnage that comes in across the bar ever comes out of the borough of Tynemouth, or the borough of South Shields?—That is a question which I really cannot answer.

3245. You are a Newcastle gentleman of considerable experience, and very large business, I believe?—Yes.

3246. I will ask you again whether in your opinion there is more than onetenth of the whole tonnage that comes in across the bar which ever passes out of the borough of Tynemouth or above Hay Hole?—Really I cannot answer the question. I would if I could, I assure you.

3247. Do not you know that in the contests which have been going on between Shields and Newcastle, that has been the great cause of complaint?—Yes, I am aware that it has.

3248. Are you a member of the Corporation?—No.

3249. Do not you know that that has been asserted times without number?—It may have been asserted, but I do assure you I have no means of ascertaining the question; if I had, I should answer it distinctly.

3250. Do you know that that has been asserted?—I believe it has.

3251. Have you ever heard it contradicted?—I do not know that I have.

3252. Do you know a pamphlet of Mr. Armstrong, the Chairman of the River Committee, as it was called in the good old times?—I do not remember it just now.

3253. Supposing he should have stated that 20 years ago there were ships drawing 14 and 14½ feet water which could come up to Newcastle quay, would it be true or false?—It is possible upon a very high tide.

3254. You think that that would be a very extraordinary emergency?—I think it would not be an ordinary tide.

3255. What is the ordinary draught of water of your vessels which come up to Newcastle quay?—They average from about 11 feet water to 13½ feet: one may be 11 and the other may be 13½ or 14 feet, and they would be intermediate; but it would depend upon the quantity of cargo which they had on board them.

3256. I have here the harbour master's return—what they call the Turn Book, and I will ask you whether within your knowledge, excepting the case of an Eliza, which we have heard of several times, which came up, and is entered as 14½ feet, consigned to Mr. Ormston, the Commissioner, there has been within the last week a single vessel drawing more than 13 feet?—I cannot speak to that.

3257. And whether the vessels generally are not 10, 11, 9, 8, 7, 6?—Our vessels are the largest class that come to the quay.

3258. Your vessels go down with steam-tugsn ow entirely, do they not?—No.

3259. They sometimes sail down, do they?—Yes.

3260. Not the larger ones?—Yes, they do.

3261. Did this one, which you speak of as drawing more than 14 feet, go down with a tug, or sail down?—That was in coming up, and she sailed up.

3262. How long is it since Tyne Main Shoal was so bad?—In 1828 it was very bad indeed.

3263. It has been getting better since then, has it?—Yes. They tried many means to improve it. I think they had a London dredger down, and they had a kind of rake behind a steamer, and then they got a dredger upon it, and since that time the sand has washed away; it has never been any nuisance to us.

3264. These observations, of which you have spoken, are as you have explained them your observations by the eye upon the foundation of the high level bridge?—They are.

Re-examined by Mr. Seymour.

3265. Have you a ship called the Wentworth Beaumont?—Yes.

3266. What does she draw?—16 feet; that is, laden going up to London; in coming down from London the ships have less draught of water.

3267. Has she ever come up with neap tides?—Yes.

3268. With what draught?—She has come up, I believe, with 12 feet 10.

3269. Do you remember when the Sardinian frigate went down the river?—Yes; I was down the same day.

2370. Did your ship, the Wentworth Beaumont, sail past her opposite St. Anthony's Point?—She did.

3271. Is that a difficult part of the navigation?—It is a very difficult part; it is a very dangerous position to be in for such large vessels passing in a narrow channel together.

3272. (*Mr. Webster.*) That was after all the dredging, was it not?—Some dredging had taken place, certainly.

3273. (*Captain Fitzroy.*) With reference to your comparison of the tonnage of ships, are you aware that the tonnage some years ago, at the period to which you referred at first, was to a great extent nominal; that ships then measuring 200 tons, drew as much water and carried as much, if not more, cargo than ships of a much greater register tonnage now?—Yes; I am aware that by the old tonnage you might build them as deep as you liked, and it had no effect upon their tonnage.

3274. The comparison of a ship measured for tonnage according to the old rule, is no means of judging what draught came up to Newcastles quay 30 years ago?—Very likely, there were no means of judging of the draught of water by the ship's tonnage.

3275. (*Mr Seymour, through the Chairman.*) Do you speak to tons burthen or tons register?——

3276. (*Captain Fitzroy.*) I was speaking of the subject generally, both burthen and register.—I was replying upon the register tonnage of ships by the old plan, according to the length and the breadth; formerly in tonnage depth was of no consequence.

3277. My question applied to this. If you say that a ship of 200 tons came up to Newcastle quay 30 years ago, and now a ship of 300 tons comes up to that quay, it amounts to no proof, because a ship of 200 tons, according to the old measurement, and the irregular way in which vessels were built, might have drawn more water, and carried more cargo, than a ship of 300 tons at the present day?—Just so.

3278. (*Chairman.*) What you mean I apprehend is, that much larger ships come to Newcastle now than did formerly; ships in all respects larger?—Much larger ships.

3279. And drawing more water?—And drawing more water.

J. Clayton, Esq.

30th January 1855.

JOHN CLAYTON, Esquire, sworn.

Examined by Mr. Seymour.

3280. ARE you Town Clerk of Newcastle?—I am.

3281. Do you also hold the office of Clerk to the Tyne Improvement Commissioners?—I do. Under the Act of 1850, constituting the Tyne Improvement Commissioners, the officers of the Corporation were continued in their offices, subject to the same power of removal as the Corporation possessed under the Municipal Reform Act of 1835, which was an absolute power of removal, making compensation to those who held office at that time.

3282. Do you remember Mr. Rennie's survey of the river Tyne made by the late Mr. Giles and Mr. Comrie?—I remember Mr. Rennie's survey. I remember Mr. Giles and Mr. Comrie being employed upon it. Mr. Comrie being Mr. Giles' assistant.

3283. Do you know how often Mr. Rennie visited the Tyne?—I saw him only once upon the Tyne during the survey. Mr. Comrie confirmed my recollection, that he was only once upon the Tyne.

3284. Do you know where his river lines were put upon the plan?—In London; Mr. Rennie, of course, drew his information from the plan, and the plan would give him the information more effectually than an inspection of the river, no doubt; but he had no opportunity of having any knowledge of the manufacturing establishments existing on the banks of the river, and I think in his report he qualifies his lines accordingly.

3285. The survey was in 1813; when was his report made?—He made his report in 1816.

3286. Do you know whether he visited the Tyne at any time between his survey and his report?—I do not think he did. I should have seen him or heard of him if he had visited it.

3287. Can you say whether the report upon the Tyne was acquiesced in by the nautical authorities or nautical men at the time?—No; our nautical authorities at that day were entirely attached to the theory which Captain Purdo now maintains, that no tidal water ought, on any account, to be displaced.

3288. What view did the Corporation take of that subject?—The general feeling was that matters should be left alone; and inasmuch as moving would cost the Corporation money, they acquiesced, and I may say, cheerfully, in that general feeling.

3289. Do you remember the Tyne Main Shoal?—I do, though not an engineer.

3290. Do you remember it as a great impediment to the river?—I remember it being very much complained of. Up to that time (I am speaking of about the years 1833 and 1834) the Corporation had attempted no dredging in the bed of the Tyne; but in consequence of the loud complaints of the state of Tyne Main Shoal, they brought down from London a Thames dredging boat or barge, and they applied it to the removal of that shoal. They found that the matter removed was very soon restored to its former position, at least replaced by other matter, and they then attempted an alteration of the shore; they applied to Mr. Ellison, whose name has been a good deal used in this Inquiry, in respect of his property lower down the river, who happened to be the owner of the land in that vicinity. He was for 20 years member for the town, and, I believe, recognizes as much as any man living the duties which attach to property; he was kind enough to assist the objects of the Corporation, and to build a quay upon a line which they set out. They then applied the dredging barge, and after the current had received a direction from the quay the dredging was effectual, and Tyne Main was, to a great extent, removed; it has, I believe, been further removed since, but still the complaints ceased upon that operation being completed.

3291. In point of fact, Tyne Main Shoal was found incapable of being removed by simple dredging?—By dredging alone. That is the result of my engineering experience.

3292. On the passing of the Reform Act in 1835, did the reformed Corporation appoint an engineer?—The reformed Corporation determined not to leave things alone, and they appointed an engineer, who proceeded to operate upon the river.

3293. Who was the engineer that they appointed?—Mr. Anderson was the first engineer appointed.

3294. Did he continue engineer until Mr. Brooks came?—Until his death, and Mr. Brooks succeeded him.

3295. Did this more active body of gentlemen take measures for the improvement of the river?—They did.

3296. Upon what principle did they set out? can you remember whether they adopted or proposed to adopt Mr. Rennie's line?—Clearly; they determined that, as far as possible, they would adopt Mr. Rennie's lines, wherever the existing establishments on the river admitted of their being adopted, without incurring a very enormous expense; and where they could not be exactly followed, they wished to adopt the principle of them.

3297. Do you recollect what was the feeling of the landowners along the river at that time?—The landholders did not at all admire the application of any process to the river which might injure their river frontage, and, therefore, there was difficulty in getting any landholder to allow the Corporation to commence operations in front of his property.

3298. Were any claims for damages brought against the Corporation?—The Corporation happened to have considerable property of their own, and they commenced operations

in front of that property; a good deal of it was let on leases, and they have had very serious claims for compensation, on the part of their lessees, and also on the part of other persons, to deal with.

3299. Some questions in this case have been raised with regard to the title to the soil of the Tyne. Can you explain the circumstances of the question of title as it affects the soil of the Tyne and the Corporation?—At present it is in rather an uncertain position; the Crown, according to the law laid down by Lord Hale, in his treatise "De Portibus Maris," claiming the soil of all navigable rivers, so far as the tide flows. In the Tyne, no act of possession has at any time been exercised by the Crown on the soil of the river, the Corporation claiming a title derived from the Crown to that soil. For the last 200 years they have exercised the power which that title gave them, solely for the purpose of enforcing the adoption of a proper line of quay by the landholders, and they have not claimed the soil which the quays erected by the landholders took from the river, seeing and feeling that such a state of things would be very injurious to the establishment of manufactories on the banks of the river; that is to say, the interposing between every man's property and the river a strip of property belonging to another; they, therefore, never asserted to the prejudice of the landowner any claim to the soil. The largest proprietors of lands on the banks of the river are the Duke of Northumberland on the one side, and Mr. Ellison on the other; both those proprietors possess monastic lands confiscated by Henry the Eighth, and passing to laymen, but originally derived by the monastery from the Crown by grant of manors; therefore Mr. Ellison on one side, and the Duke of Northumberland on the other, through the space which has been much referred to, claimed the soil, deriving their title under grant from the Crown anterior to the title of the Corporation.

3300. Has the Solicitor to the Woods and Forests made any claims on behalf of the Crown?—When the Bill for the Hay Hole Dock was before Parliament, the Solicitor of the Woods and Forests interposed for the Crown, and clauses were put in reserving the rights of all parties claiming an interest in the soil of the river; the consequence has been that a valuer appointed by the Crown, a valuer appointed by the Duke of Northumberland, a valuer appointed by the Corporation, and a valuer appointed by the Tyne Improvement Commissioners, have settled the price to be paid out of the dock fund for the land occupied by the dock; that sum is to be appropriated for the benefit of the party who shall turn out to be entitled. The attention of the officers of the Crown having been attracted to the south shore as well as the north, the Commissioners of Woods and Forests have invited Mr. Ellison and the Duke of Northumberland to a discussion of their title; they (the Commissioners of Woods and Forests) have proposed that those proprietors should submit a statement of their title to the Solicitor of the Commissioners of Woods and Forests, and that with a view of avoiding litigation, that statement should be laid before some eminent counsel, to be agreed upon on both sides. Mr. Ellison has accepted that invitation, has laid his title before the Solicitor of the Woods and Forests some eight or ten months ago, and nothing further has taken place. The Duke of Northumberland hesitates, I think, but I cannot say whether the Duke of Northumberland has or has not accepted the invitation. I happen to be concerned professionally for Mr. Ellison, and therefore I have a positive knowledge of his proceedings, but I do not know what the Duke of Northumberland's solicitor has done, except that it has not been decided among the three contending parties who is to receive the purchase money of the site of the Hay Hole Dock.

3301. The Tyne Improvement Act, I think, passed on the 15th July 1850, constituting the present Commission?—It did.

3302. Does it contain any powers for works?—It does not contain any powers for works; as originally framed it did, but the Committee of the House of Commons expunged those powers. My gallant friend, Captain Linskill, stated the circumstances under which that bill passed not quite accurately; I am quite sure, without the smallest intention on his part to mis-state anything, but not being a professional man, he does not remember so correctly its stages as I do. It certainly was in all points, except one which I shall state, an arrangement of compromise. The Committee of the House of Commons, before whom that Bill was, (I refer to the Bill which was promoted by the Corporation of Newcastle,) after having passed the preamble of the bill, recommended the parties promoting and opposing to meet together and to agree as far as possible on the details; a meeting in consequence took place. The first point discussed was the principle of introducing Admiralty Commissioners; the parties opposing pressing for the introduction of four Admiralty Commissioners; the parties promoting feeling or thinking that such an introduction tended to centralisation, which is not popular in this country, resisted the introduction of any Admiralty Commissioners, and finally that point was arranged as is provided in clause 13 of the bill, by which four life Commissioners were appointed, giving the Admiralty the power of supplying the places of two of them when vacancies shall take place by death or otherwise; that point was therefore agreed upon, and every other point was agreed upon except the representative portion of the constitution; the parties not being able to agree upon the division of the representation, came to this arrangement, viz., that the Committee of the Commons, of whom Sir John Yarde Buller was chairman, should hear the counsel on both sides upon that part of the question, and that the parties should adopt their decision; their decision produced the representative constitution as it at present exists under the Act. Then my

J. Clayton, Esq.
30th January 1855.

friend Captain Linskill has adverted to the introduction of clause 64 in that bill in the House of Lords; that I can explain. The legal advisers of the Corporation advised them that clause 28 of the bill had the effect of transferring to the new body all liabilities incurred by the late body, and they were satisfied that it had that effect. But clause 63, in a subsequent stage of the proceedings, as it now stands, was introduced at the instance of the advisers of the Duke of Northumberland, who were then under great apprehension of the effect upon their shipping-places of the following out of Rennie's line below Willington. By that clause a right of action is reserved against the Corporation in respect of their previous acts as Conservators, the Duke of Northumberland's advisers saying that the Corporation were then liable for the damage that might arise from those protrusions into the stream, and that they knew that the Corporation could pay them, but that they did not know that the Commissioners could, and therefore they reserved specially a right of action against the Corporation, which rendered necessary, in the opinion of the legal advisers of the Corporation, clause 64, which was introduced in the Lords.

3303. When the four Admiralty Commissioners were asked for by the opposing parties, were there life Commissioners besides those four proposed by them?—No; the four life Commissioners were substituted for the four Admiralty Commissioners.

3304. Then the fact of four being life Commissioners formed part of the terms?—We agreed upon that clause.

3305. We have heard something about an opinion of Mr. Cowling; it was referred to, I think, in the opening speech of Mr. Webster; do you remember how that opinion was taken, or what was the cause of it?——

(*Mr. Webster.*) I do not make any imputation with respect to it, but merely mention it as an illustration of the competing interests.

(*Mr. Clayton.*) I am sure you did not mean anything offensive, but still, what you said, makes it necessary that I should give an explanation. The question was, whether the rolling stock of the Corporation as Conservators passed by the Act of Parliament of 1850, to the Commissioners. On the 9th February 1851, at their meeting, the Commissioners asked me my legal opinion upon that question. I begged that they would excuse my giving an opinion, because I felt myself not in a position to give an opinion between two parties, for both of whom I was concerned, and I suggested that they should take the opinion of a barrister upon it, and also, (and I am very glad to find that I took that precaution,) though it seemed a very simple question, I desired that they themselves should see and consider the statement which should be submitted to counsel. At their next meeting I produced the draft of a statement which I read to the Commissioners, and went through it very carefully with them, and received their acquiescence in its facts. It then remained to be considered what barrister should be selected. I suggested Mr. Ingham, the honourable Member for South Shields, whose ability and independence of character were known to us all, but my friend Captain Linskill, who happened to be present at that meeting, said he would prefer some barrister who had no local connexion, and I then named Mr. Cowling, with whom I was not personally acquainted, but whom I knew only by his high character as a sound lawyer, and who I knew had on no occasion acted as counsel for the Corporation. The Commissioners were pleased to adopt that suggestion; the case was submitted to Mr. Cowling, and his opinion was acquiesced in by both parties.

3306. (*Mr. Seymour.*) About that time, I believe, the Corporation were delivering ballast on their property at Willington?—Perhaps some general statement as to the ballast may be of use in this stage of the proceedings. In all coal ports it is a great burthen to get rid of the ballast; nine-tenths of the ships enter the port in ballast; the consequence is, that you see piled on the banks of the Tyne most unsightly heaps of ballast. The estates of the Corporation at Walker and Willington, on the north side of the Tyne, have been for the last 100 years places of deposit for ballast. Mr. Brunel asked why the shipowner did not go to the ballast crane, where he could get it most cheaply delivered. The ships come in in crowds, sometimes 200 in a tide, depending upon the wind; they all want to get rid of their ballast with as little delay as possible, and they go to the ballast establishment nearest to the colliery where they intend to take in their coals; and it is necessary at Walker and at Willington for the sake of the ships loading with coals in that part of the river, to maintain ballast establishments there. The Corporation were delivering ballast at Walker and at Willington; at the time of the passing of the Act of 1850, there was no agreement as to the terms of delivering ballast, because they were the Conservators as well as the owners of the land and machinery. At an early meeting of the Commissioners, the question arose as to what was to be paid to the Corporation for continuing to deliver ballast. A committee of the Commissioners met a committee of the Corporation, and discussed the matter, the Corporation asking 9*d.* per ton. On the 4th of March 1851, at a meeting of the Commissioners, it was moved by Captain Purdo, and seconded by Mr. Hawkes, who was one of the Gateshead representatives, that 8*d.* per ton should be offered; that was accepted by the Corporation, and has been paid to them ever since. Any individual who thought it was too much, might at any time have made a motion that it should be discontinued, and the Corporation would have discontinued their delivery of ballast. An amendment was moved by Mr. Poppelwell, I think, upon the offer of 8*d.*, that it should be 6*d.*, but that was rejected by the majority, who, I suppose, imagined that the Corporation would not accept that rate of payment. In that negotiation, and in this affair, I took no part whatever; it was out of my department altogether. The Corporation, as has been stated from their accounts, have made a profit

of this delivery of ballast, but those accounts do not show the whole truth, inasmuch as so charge is made on the debit side of the account for the capital of the Corporation employed in machinery, which is a depreciating capital, and which is of considerable amount. Mr. Stevenson very correctly stated, that the delivery at Willington was at an end, inasmuch as the space is filled up in which they received it, and the Corporation estate there is already covered with mounds of ballast; but in consequence of the representation of persons interested in the trade of the port to the Corporation, of the importance of having a ballast delivery continued at Willington, the latter have recently made an arrangement with the owner of an adjoining estate, for the conveyance and delivery of ballast upon that estate; the Corporation are constructing a railway for the purpose of conveying the ballast over their own into the neighbouring land, and the result of this will be, as the figures shown to me prove, that there will be no profit at all in future. The finance committee of the Corporation, as a matter of finance, would not have continued this ballast delivery at all, but for the sake of the trade of the port they do continue it. The Commissioners receive 16*d.* por ton for all the ballast entering the river, and they get rid of it as they can. They pay at Shields, to Mr. Salmon and Mr. Swinburn, whose establishments are very expensive, larger sums than they pay at the less expensive establishments, but the Commissioners in all cases endeavour to make the best bargain they can, when the delivery of ballast is in the hands of individuals, and I believe they have showed no favouritism to any one, but have done their duty to the public and their constituents.

3307. When did the Commissioners receive Mr. Rendel's report?—Mr. Rendel had been employed by the late Conservators to report upon the improvement of the Tyne.

3308. (*Chairman.*) In what year?—The first meeting of the Commissioners was held in November 1850. They did not receive Mr. Rendel's report till October 1851. Mr. Rendel had been employed for two or three years previously to 1851.

(*Mr Webster.*) August 1848, Sir.

3309. (*Mr. Seymour.*) What did the Commissioners determine on doing immediately upon receiving that report?—I think there was no material difference of opinion amongst them at that time. I found scarcely any division. When we received Mr. Rendel's report it was very near the expiration of the period within which notices must be given of an application to Parliament for the next Session. We must deposit all plans by the end of November, and give our notices three weeks in November. The Commissioners set themselves to work to consider what works were most pressing, and they determined immediately to give notice of an intention to go to Parliament for piers at the mouth of the river, and for the Hay Hole Dock. The Hay Hole Dock occupies a bay, which Mr. Rennie recommended to be entirely excluded from the channel of the river by a half-tide wall. In that bay upwards of a million tons of coal are shipped yearly. The consequence of adopting Mr. Rennie's plan would have been that all the staiths used in shipping coals in that bay must have been extended to the new river line, which could not reasonably have been expected to be done by the owners of the staiths, inasmuch as it was a work for the general improvement of the navigation, and the Commissioners would have had to appeal to the owner of the land, who was the Duke of Northumberland (who, I am sure, would have interposed no obstacle), for power to do it. We found that the cost of that operation would exceed 50,000*l.* Mr. Rendel, in his report, recommended that that space should be occupied with a half-tide dock. The owners of the collieries, shipping their coals in that bay, told us that a half-tide dock would be of no use to them; that their staiths must still be brought out to the river line over that half-tide dock, and that we must incur that expense. The Commissioners then, I think very judiciously, determined to convert it into a full-tide dock. Then, in order to raise the funds, they arranged with the owners of collieries shipping coals in that bay, that they should for a given number of years ship their coals at a certain rate in the docks when they were made, which ensured a certain revenue from the opening of the docks, and which revenue was sufficient to pay the interest of the estimated capital, and to redeem it within a moderate number of years. The Commissioners took power in their Act to borrow the money required to complete the docks upon the security of these prospective dues, and to pay interest out of capital until the docks were opened. The return which will be produced in the dock at the rates agreed on is so certain and so ample, that so far they have found no difficulty in getting the means of going on with that dock, which is in a very forward state, and by that means the Commissioners have effected the improvement suggested by Mr. Rennie, and which would have cost them so large a sum if it had been effected otherwise, without any charge whatever on the river funds. I ought to mention that Mr. Rendel's estimate for the half-tide dock was 107,000*l.*

3310. What was the next work to which the attention of the Commissioners was directed?—The piers, I believe, they considered the first and the greatest object of all; but there was unfortunately a very great difference of opinion as to the particular line —no less than seven different piers were projected—Mr. Rennie's, Mr. Rendel's, Mr. Brooks', Captain Vetch's, Captain Washington's, Mr. Thomas John Taylor's, and Mr. Calver's. Having no time between October and November to give very much consideration to the subject, the Commissioners directed their engineer to lay down what appeared to them and to him to be the most likely line to be effectual, and they took sufficient powers of deviation in the Act to admit of their adopting any of the plans; and in that shape the Act passed. The Act received the royal assent on the 17th of June

J. Clayton, Esq.

30th January 1855.

1852. The Commissioners then felt themselves very much perplexed by the variety of plans of piers; they gave the matter much consideration, and they did not for some time see the way in which they could proceed. It seems that I took the first step in that matter. Captain Linskill says, without authority, the expression in my letter is just the expression of an individual who has no authority. I wrote to the Lords of the Admiralty on the 18th of April. Being very anxious that we should get on with these piers, and having communicated with the Chairman and some other members of the Commission, I took upon myself to write to their Lordships, to the effect that if they would approve of the plans of the piers being submitted to Mr. Walker, there would be a probability that the Commissioners would feel themselves justified in acquiescing in any alteration in their Parliamentary plan which Mr. Walker might decide upon. I think I did not take too much upon myself in writing such a letter as that. Mr. Walker was introduced to the Commissioners as the Admiralty Inspector upon this bill; that was their knowledge of him. I had a previous knowledge of Mr. Walker, and of his high character as a nautical engineer. The Admiralty accepted this suggestion, and the Commissioners were pleased to acquiesce unanimously in it. Mr. Walker made two or three visits to the spot; he heard the suggestions of all parties; he heard all their evidence with very great patience; and on the 15th of November 1853, he made his report upon the piers, which is before the Commissioners.

3311. Adopting in substance, I believe, Mr. Brooks' plan?—Mr. Walker very justly gives credit to Mr. Brooks and the Commissioners; he adopts their Parliamentary plan with some variations.

3312. Captain Linskill has said something about not communicating resolutions by letter to Mr. Walker?—We will come to that presently. Having got that report from Mr. Walker, the next step was to estimate the cost, and to get the working drawings approved of. On the 12th of December a plan, prepared by Mr. Walker, was lodged at the Admiralty. The Commissioners apprehending that the expense of the works would be very considerable, and feeling that these piers would form a harbour of refuge in which the whole country would be interested, a deputation of them attended upon the Admiralty and the Board of Trade in the month of March last, with the view of enforcing upon the Government the propriety of aiding them out of the national funds; and I put before you the report of the proceedings of that deputation. The deputation were not at that time successful. I think they were told that it was an unfavourable period to apply to the Government; that the exigencies of the war required great financial exertions; but they returned home, not in despair, but hoping that at some future time they might receive the aid sought. We then pressed the Admiralty for their approbation of our plans and working drawings; and in the month of May we had some personal communication with Captain Vetch and Captain Washington, who both of them expressed, and I think very justly expressed, considerable apprehension as to the amount of expenditure which would be necessary to carry out the plans; the section of Mr. Walker, which was with the plan, showing piers of masonry on both sides. That discussion with the Admiralty ended with a communication from the Secretary to the Admiralty, dated 29th May 1854, which I will read. "I am commanded "by the Lords Commissioners of the Admiralty to acknowledge the receipt of your "letter of the 18th instant, requesting the Admiralty approval to the plans and sections "for piers at the entrance to the river Tyne, and which were lodged at the Hydrographic "Department of the Admiralty on or about 12th December last; and in reply thereto "I am directed to observe that the plans and sections of the works alluded to are not "understood as the working plans required by the Act; and without any estimate on "the part of the Commissioners, the works are considered likely to cost not less than "600,000*l.*, or three times the amount contemplated by the Act; that the approximate "estimate mentioned in your letter of 18th instant, viz. from 300,000*l.* to 400,000*l.*, is "understood to be in respect to the section of Mr. Brooks, and not to that deposited on "12th December, and for which Mr. Walker is responsible. In leaving the decision of "the case in Mr. Walker's hands, as proposed in your letter of 18th April 1853, their "Lordships were under the impression that he would be limited by the Commissioners "within the sum contemplated by the Act, or within a reasonable margin thereof, but "which does not appear to have been the case. Their Lordships are, however, desirous "to avoid causing any delay or difficulty to be placed in the way of the Tyne Commissioners, and if in consequence of the unexpected and great cost of the piers proposed by "Mr. Walker, they have any deviations to propose, their Lordships will give the same their "best consideration; but if they adhere to the deposited plan, the Admiralty can only "assent to so much of the works as will come reasonably within the cost and within the "provisions and intentions of the Act; viz., their Lordships will assent to the construction of the north pier on the section of Mr. Walker, to the extent of 1,400 feet "from the shore, and to the laying down of so much of the core of the south pier, as "shall constitute a rubble stone dyke, reaching to not more than 6 feet above high-water "mark, and to an extent not exceeding 2,800 feet from the shore; and when the Tyne "Commissioners relieve the Admiralty of the difficulty and responsibility of assenting to "works without sufficient estimates and funds, their Lordships will assent to the extension "of the work." Having obtained the assent of the Admiralty to the execution of the works to a certain extent, the Commissioners applied themselves to having the detailed drawings and specifications prepared. They also entered into a negotiation with the Board of Ordnance and the Duke of Northumberland, the owners of the land necessary

to make the approaches to the pier on the north side, both of which negotiations have been satisfactorily concluded. They have bought of the Dean and Chapter of Durham, 36 acres of rock on the south side, near to the site of the south pier, and they have formed a railway from that rock to the side of the pier. There has been some difficulty, and perhaps some little misunderstanding, in getting the working drawings into proper form, and properly approved of, which I trust will not long remain unremoved; but it is right that I should read the last letter which we have received from the Admiralty on the subject, which is dated the 22d of January 1855:—"I have to acknowledge the receipt of your letter of "18th January, in which you request their Lordships' assent to working plans for the "north and south piers at the mouth of the Tyne, left at the Harbour Department by "Messrs. Clay and Robinson, two of the Commissioners; and in reply thereto, I am "commanded to state that their Lordships have given full consideration to the subject, "and regret to find that considerable difficulty has arisen in the matter. The Tyne "Commissioners must be fully aware that after great variance of opinion it was proposed "that the plans of the piers should be referred to an engineer of standing, in whom their "Lordships, the Tyne Commissioners, and the public, might place full confidence, and who "should take the entire responsibility of his own recommendation as the best guarantee "for obtaining a well-devised plan of the structures. The Tyne Commissioners proposed "Mr. Walker to be the engineer selected, in which advice their Lordships concurred. "On the 15th November 1853, Mr. Walker forwarded his report on the case, with two "plans, one showing the outline of the north and south piers which he proposed, and the "other profiles of the north and south piers to scale. Their Lordships saw the difficulty "of assenting to the entirety of plans of such vast extent as those proposed by "Mr. Walker, and for the execution of which there were no adequate funds; but in order "that no time should be lost, their Lordships stated their readiness to assent to the con-"struction of 1,400 feet of the north pier *on the section of Mr. Walker*, and to laying down "2,800 feet of rubble stone hearting or core of the south pier across the Herd Sand; but "their Lordships perceive that the working plan of the north pier, as lately left at the "Admiralty for assent, is not in conformity with the profile of Mr. Walker, and that the "cross sections of the south pier do not show merely the core of that breakwater, but a "finished section of the work, and their Lordships regret that they see no reason to alter "their decision of 29th May 1854, in this particular. I am further directed to recall your "attention to the basis of the agreement, that by the employment of an engineer of great "standing in his profession, it was intended to throw the whole responsibility of the work on "him as a guarantee to all other parties interested, and that his skill and judgment should "not be confined to the mere outline of the piers, but be equally applied to the construction, "viz., that Mr. Walker should be responsible for the working plans, the description of "material used, and the specification of work and its execution. Their Lordships do not "perceive that Mr. Walker has been consulted or has approved of the works for which the "Admiralty assent is now asked; but unless that be the case, Mr. Walker's responsibility "in his own plans will be entirely lost, and there will be no guarantee to the Lords Com-"missioners of the Admiralty, or to the general interests of the Tyne, that the work will be "successfully carried out, or, in case of failure of the works, where the responsibility would "rest. Their Lordships, therefore, trust that the engineer who designed the works will be "enabled to see them carried out on the details which he conceives necessary to their "success and safety."

3313. (*Chairman.*) That letter you have not answered?—The Commissioners have not had time yet to answer it.—From their construction of the Admiralty letter of 6th May 1853, it appears clear that the Commissioners' engagement with the Admiralty terminated by Mr. Walker's report of November 1853. The Commissioners have since arranged with Mr. Walker that he should be their consulting engineer, but there is some little misunderstanding about these plans, which I think will be removed shortly. My friend, Captain Linskill, complained of me. I think the extent of the charge was that I served Mr. Walker personally with the resolutions of the Commissioners of 4th May 1854, instead of writing a letter to him with them.

3314. (*Mr. Webster.*) It was that the resolutions were never communicated at all in writing?—I delivered a copy of the resolutions personally to Mr. Walker in the presence of the Chairman.

3315. I think that was afterwards?—Within a short time, as soon as the Chairman thought it necessary; I did not verbally communicate the resolutions, but I delivered a copy of them.

3316. (*Mr. Seymour.*) You have the Minute Book of the Commissioners, will you refer to Captain Purdo's motion of the 8th December 1853, at page 142, and will you read the entry which you have there, or state briefly what it is?—"Resolved, on the motion of "Mr. Purdo, seconded by Mr. Stevenson, that the engineer be directed to furnish a "report showing the number of acres of land that have been abstracted and are now "under the operation of being abstracted from the tidal space (by the operation of the "full-tide walls and the transverse jetties) subsequent to the year 1840, on each side "of the river between Bill and White Hill Points, including the space sanctioned by "Parliament for the Northumberland Dock, distinguishing that which is already solid "land from that which is under the operation of silting and filling up."

3317. What was the fate of that resolution?—It was passed as a matter of course, without any observation or division.

J. Clayton, Esq.

30th January 1855.

3318. Will you refer now to the 23d of March 1854, page 154?—"Captain Purdo " moved, and was seconded by Mr. Stevenson, That no further encroachment be per- " mitted to be made upon the tidal space of the river until the report is furnished and " read to this Commission, which the resolution of the 8th of December last directed the " engineer to furnish. Mr. Rayne moved, as an amendment, and was seconded by " Mr. Carr, That the information sought for can be of no value and ought not to be fur- " nished; which amendment, on being put, was carried on a division, there being for the " amendment nine votes, that is to say, Mr. Cowen, Mr. Straker, Mr. Robinson, " Mr. Ormston, Mr. Rayne, Mr. Ridley, Mr. Carr, Mr. Clay, and Mr. Armstrong, and " against it two votes, that is to say, Mr. Stevenson and Mr. Purdo."

3319. Mr. Straker was in the majority there?—He was.

3320. Will you refer to the 4th of May 1854, page 161?—" A letter from Messrs. An- " drew Leslie and Company, of Hebburn Quay, asking the permission of the Commissioners " to fill up with hard material the slope from their works to the half-tide wall in front, " having been read, Mr. Stevenson moved, and was seconded by Mr. Purdo, That the " application be refused. Mr. Rayne moved, as an amendment, That the application of " Messrs. Leslie and Company be complied with, so far as the ground in front of the " piece of ground they were formerly allowed to enclose, marked on the plan signed by " the Chairman, the Commissioners reserving the right of filling. On the motion of " Mr. Rayne, seconded by Mr. Ormston, the standing orders, having been suspended, on " a division there being for the suspension of the standing orders eight votes, namely, " Mr. Cowen, Mr. Dodds, Mr. Straker, Mr. Ormston, Mr. Rayne, Mr. Poppelwell, " Mr. Armstrong, Mr. Carr, and against it five votes, viz., Mr. Ridley, Mr. Stevenson, " Mr. Robinson, Mr. Clay, and Mr. Purdo. The amendment moved by Mr. Rayne was " then put and carried on a division, there being for the amendment seven votes, viz., " Mr. Cowen, Mr. Dodds, Mr. Ormston, Mr. Rayne, Mr. Poppelwell, Mr. Armstrong, " and Mr. Carr, and against it six votes, viz., Mr. Straker, Mr. Ridley, Mr. Stevenson, " Mr. Robinson, Mr. Clay, and Mr. Purdo." That was an application from Mr. Leslie, who is a tenant of Mr. Ellison, to maintain his communication with the river frontage. The Commissioners have made or begun to make a half-tide wall extending down the whole of Mr. Ellison's shores. Mr. Ellison feeling, I believe, that their object is finally to benefit the navigation, and that he will receive justice from the Commissioners, has interposed no obstacle, though he had a considerable space of deep water along that shore before; but Mr. Leslie, one of his tenants, is excluded from his river frontage by a bank of mud produced by the half-tide wall or other works of the Commissioners. He might, perhaps, not unreasonably, have asked the Commissioners to make his communication with the new river line themselves, but, as I understand his application, it is that he should be allowed to harden the bank of mud between his works and the new river frontage produced by the works of the Commissioners.

3321. It is a very small space?—Yes.

(*Chairman.*) How many acres?

(*Mr. Seymour.*) Half an acre.

(*Mr. Clayton.*) I do not attend the Commissioners in their views, and therefore do not personally know the place, but, as I read it, the application appears to be merely to harden this communication across the mud bank.

3322. I observe that Mr. Straker and Mr. Poppelwell are in the majority for the suspension of the standing orders?—Yes.

3323. Will you refer to the 20th of July 1854, page 169, the first letter to Sir James Graham; was it read at that meeting?—It was read at that meeting. It was a reply to a letter which the minority of the Commissioners had addressed to Sir James Graham on the 3d of June.

3324. It was carried, I believe, by a majority of eight to four?—Eight to four; there were twelve present at that time.

3325. On the 17th of August last was a committee appointed to take such steps as they should think expedient to prepare for the meeting of the Royal Commissioners?—Yes.

3326. Was it determined to ascertain by re-survey the state of the river up to the present time?—That Committee determined that that would be an important step to take for the purpose of giving information to the Royal Commissioners.

3327. Did you, acting upon the authority of that committee, write to Mr. Alexander Comrie?—I wrote to Mr. Alexander Comrie (who unfortunately died this month) who I knew had assisted in making the survey and the soundings for Mr. Rennie in 1813, and had made the soundings for Mr. Rendel 1849. I wrote to him to ask him to come here to receive his instructions.

3328. What were the instructions you gave him?——

3329. (*Mr. Webster*) You wrote a letter I suppose?—No; I gave him instructions verbally upon his arrival.

3329*. (*Mr. Seymour.*) Were the instructions which you gave pursuant to the direction of the Committee of the Commissioners?—They were. The committee were present at the interviews with him, but the instructions I gave him were to repeat all the soundings which he had made for Mr. Giles in 1813, and for Mr. Rendel in 1849, upon the plan of Mr. Rennie. I read to him this passage in Mr. Rennie's report as to the velocity of the current. " The " velocity of the current of the flowing tide in springs above Shields Narrows is about " three knots per hour at half flood, and about half ebb the current is about $3\frac{3}{4}$ knots per

" hour." I asked him if he knew that place; he said he did, that he had made those experiments in 1813 himself, and I said, " Repeat the same experiments, and let us " know the result;" that was the instruction which I gave to Mr. Comrie.

3330. Is there anything further which you wish to add?—Nothing occurs to me at this moment.

3331. In your opinion has the Commission worked efficiently or not?—I think it has worked efficiently, and I think Mr. Straker did himself great injustice when he said that the devil would have made a better conservator.

(*Chairman.*) There is one point,—I do not know whether you are to bring it out by Mr. Clayton's evidence; he has explained the matter with regard to Mr. Leslie, but not as to Mr. Palmer.

(*Mr. Seymour.*) I am much obliged to the Chairman.

(*Mr. Clayton.*) I shall have some papers immediately which will enable me to speak upon that point.

3332. (*Chairman, to Mr. Brooks.*) What is the extent of Jarrow Slake?—350 acres.

(*Mr. Clayton.*) Messrs. Palmer and Company are lessees of part of Mr Ellison's land and also of a part of the land of an adjoining proprietor, Mr. Brown. The first record which I have of an application from them is this, " An application from Messrs. Palmer, Brothers, for licence to erect a quay in front of premises occupied by them at Jarrow, was read, and it is resolved that Messrs. Palmer be requested to furnish a plan of the shore on or before the 20th instant, when the Commissioners will view it." That is dated the 8th of April 1852. Then appears this plan, which bears date the 13th of April 1852; this end of the plan professes to show the line of quay they wished to build. I having no local knowledge of the spot, must leave to others to explain the plan.

(*Mr. Brooks.*) The original application was for the part described by the red line upon the plan. The Commissioners on viewing the premises, stated that they would require the applicants to come further out into the river, to a line which should be in accordance with the works about to be carried on upon the opposite shore of the river, that is, the southern line of the Northumberland Dock. At the time of the application, the lower jetty extended out to the point marked on the accompanying plan.

(*Chairman.*) And you told them that they must bring it out how far?

(*Mr. Brooks.*) In consequence of the new arrangement of the north shore line, it was determined to set the present works back 30 feet, they having originally projected further into the river, for the purpose of throwing the water into the Hay Hole channel; a line was then drawn upon the plan in pencil, as now shown, about 40 feet from the outer point of the jetty.

(*Mr. Armstrong.*) Then this outer point of the jetty is to be removed, is it?

(*Mr. Brooks.*) That has since been removed by the Commissioners under my directions to the workmen, and at the time the pencil line was drawn, I put the point of my compasses through the pencil line shown upon the plan, (and that will be seen by holding it up to the light,) so that no alteration could possibly take place. Those marks are to be seen now, and they were made at the time to ensure that there could be no possible change. Then, subsequently, under the directions of the Commissioners, I set back the wall which had been already made to the pencil line, and it was then determined that Messrs. Palmer should enclose all the shore eastward of the lower jetty. That was, I believe, unanimously agreed to by the parties present; Captain Purdo was there, Mr. Stevenson was there, I believe Mr. Straker was there.

(*Mr. Stevenson.*) I am quite as much a witness as Mr. Brooks is.

(*Mr. Webster.*) That will appear by the resolutions. Mr. Stevenson will probably deny this; if there is a resolution, it is quite as well that it should be read, and that will make it clear.

(*Chairman.*) All we wanted was Mr. Brooks' explanation, which Mr. Clayton was unable to give us.

(*Mr. Webster.*) I did not wish to stop him; it was necessary that he should not go beyond the explanation, now that Mr. Clayton is in the box.

(*Mr. Armstrong.*) This is what took place upon the ground when the Commissioners went down to see what it was that Messrs. Palmer wanted.

(*Mr. Webster.*) Exactly so, Sir.

(*Mr. Armstrong.*) Then was what was done by the gentlemen who went to view the land upon this occasion afterwards entered into the books?

(*Mr. Clayton.*) We will take the next step. The next minute I have of the Commissioners is dated the 13th of May. " The application of Messrs. Palmer and Company for " liberty to make a jetty and form a line of quay at Jarrow Grange was considered. It is " resolved, that a licence be granted to Messrs. Palmer and Company to erect a quay of " such materials and construction as shall be approved of by the engineer on the line " agreed upon at the view of 20th April last, the applicants agreeing to remove or alter " the line as the Commissioners may require, and that the owner of Springwell Colliery " be allowed to erect and use a third spout on the usual terms. An amendment moved by " Mr. Stevenson, seconded by Captain Purdo, to defer the granting of the quay, having " been previously negatived by a show of hands."

3333. (*Chairman.*) Does that conclude the whole history?—No, it goes on a good deal further. Then comes a resolution on the 28th of October 1852, " That a licence be granted

J. Clayton, Esq.

30th January 1855.

" to Messrs. Palmer and Company, to land and convey ballast behind their quay at Jarrow, " on such terms as shall be arranged by the Finance Committee, subject to the sanction " of the Commissioners."

3334. (*Mr. Seymour.*) Was that resolution carried?—It was passed without any division.

3335. Was Mr. Stevenson present on that occasion?—Yes, he was. On the 27th of January 1853, "Mr. Brooks reported, that the bed of the river Tyne and foreshore " proposed to be enclosed under licence by Messrs. Palmer and Company at Jarrow, will " embrace an area of 5 acres and $\frac{9}{10}$ths of an acre."

3336. (*Chairman.*) Then that was no deviation from the original plan which was approved by the Commissioners on view?—No. We find a discussion afterwards which took place on that; then comes a resolution of the Commissioners, dated 17th August 1853, " Resolved, that the clerk give notice to Messrs. Palmer and Company, to suspend their " river works at Jarrow until they shall have submitted a plan of such works to the " Commissioners, and until such plan shall have been approved of." That was passed without opposition. Then comes a resolution of the 22d of September 1853. I ought perhaps to read first a letter of Messrs. Palmer, Brothers, and Company, explanatory of their then position, dated the 7th of September 1853; they write, " To the river Tyne " Commissioners:—Gentlemen, Some misapprehension appears to exist with reference to " the application made by us for permission to erect a quay at Jarrow. We therefore think " it advisable to recapitulate the circumstances connected with our application, in order " that you may be satisfied that it has been throughout as perfectly specific and distinct " as the resolutions (passed by your Board and communicated to us) have been free from " ambiguity. On reference to our memorial of the 1st April 1852, it will be perceived " that we informed your Board that we had taken leases from Mr. Ellison and Mr. Brown " of land at Jarrow, having frontage to the river, but which could not be made available " for manufacturing purposes without the erection of a quay. We then invited your " Board to decide on a permanent quay line, suggesting, in the event of your feeling any " difficulty in coming to a decision, the grant of a temporary quay. On the 8th April we " were requested to furnish a plan, which was accordingly prepared and handed in, " showing on the face of it the properties of both Mr. Ellison and Mr. Brown. A survey " was held on the 20th April, at which this plan was produced; the subject was fully " discussed, the idea of a temporary quay abandoned, and a permanent quay line drawn " in pencil on the plan, extending over both properties; the Commissioners agreeing at " the cost of the Commission to cut off a projection between the two propreties, so as to " make the line straight. At the meeting held on the 13th May, this decision was " sanctioned, and a resolution in conformity passed and communicated to us. It is now " after a lapse of many months intimated to us that it was intended only to sanction a " quay in front of the property belonging to Mr. Brown, and that in some report made " to your body at a subsequent date, an estimate had been made, limited to his land. We " may dispose of the latter circumstance by observing that the estimate was not framed " by us, or with our knowledge, and that we therefore cannot be in anyway affected by " it. With reference to the suggestion that it was intended as a grant of line in front of " Mr. Brown's property alone, we would observe that our memorial expressly mentions " the property of Mr. Ellison, as well as that of Mr. Brown; that the plan which was " asked, distinctly shows the frontage of both; that the line drawn in pencil at the survey, " and which still exists on the plan, extends along both; and that the resolution subse- " quently passed, granting us the quay, expressly mentions Mr. Ellison's estate by name. " We may add, with reference to Mr. Brown's estate, an extended quay line had in fact " been arranged prior to the establishment of your Board, as part of an arrangement " under which Mr. Brown abandoned his claim for damages for the destruction of his " ship-way by the river works. Relying upon the vote passed by your Board, we have " completed our lease from Mr. Ellison, and taken upon ourselves in this and in other " respects very heavy responsibilities. Such are the circumstances of our case, and we " hope this explanation of them may be satisfactory. No parties can have a greater " interest in the improvement of the river, in this particular locality, than ourselves; and " if it be desired, we are ready to meet your Board, and arrange the period that may be " deemed most expedient for the completion of the works on Mr. Ellison's shore." The resolution of the 22d September 1853 is this: " On the motion of Mr. Allhusen, seconded " by Mr. Ridley, it is ordered, that the engineer do inquire and report to the Commis- " sioners whether any deposit has been made by Mr. Palmer or any person since their " proceedings were suspended by order of the Commissioners." On the 8th of December 1853, it was " Resolved, on the motion of Mr. Straker, seconded by Mr. Purdo," and passed without any opposition, " That Messrs. Palmer and Company, having raised the " river wall at Jarrow to within a few inches of high-water mark, without the permission " of the River Commissioners, the same be ordered to be lowered to the level originally " proposed by the Commissioners." The next resolution is on the 19th of December. " The Commissioners having viewed the chalk wall at Jarrow bight, which was ordered " at the last meeting to be taken down to the original level, found that the same had not " been taken down pursuant to the order. The Messrs. Palmer, who were present, stated " that they did not make the said wall, and that the works were executed by the River " Commissioners. Messrs. Palmer and Company admitted having driven the piles east of the " new staith, and in front of the chalk wall, under the impression that the Commissioners " gave them permission to do so when they viewed the works in May 1852. Mr. Brooks

" stated, that the general raising of the wall above what it was in May 1852, had been " caused in altering and setting back the line of frontage, as ordered by the Commis- " sioners. Mr. Palmer denied having put down the 15 tons of chalk referred to in " Mr. Brooks' report upon Mr. Palmer's works, and Mr. Brooks stated that the same " was not deposited by any of the workmen of the Commissioners under his directions." That is all that I find upon Messrs. Palmer's works. I would observe, that the Commissioners have, since their institution, granted no licences to enclose portions of the foreshore. Parties who have done so, who are very few in number, have acted merely upon the Commissioners' resolutions. As their legal adviser, I should have much hesitation in recommending the grant of a licence; and if it were granted, it must be most carefully framed, lest the Commissioners should take upon themselves a responsibility which does not belong to them. Their licence would not protect the party making the enclosure from giving notice to the Admiralty, under the 46th George the Third, chapter 153, nor would it protect a party from an indictment by any person who considered that it was a question of public nuisance; the question of nuisance or no nuisance might still be brought before a jury, and the Commissioners might be placed in an awkward situation if they granted any licence. All that they say by their resolutions is, As Conservators of the Tyne, we think it may be safely done.

3337. (*Mr. Armstrong.*) You do not object to its being done, as Conservators of the Tyne?—That is all. We do not license it, because we can claim no title to the soil, inasmuch as the title of the Corporation is expressly reserved to them in the Act which constituted the Commission.

Cross-examined by Mr. Webster.

3338. You say that the present Conservators can claim no title to the soil, inasmuch as that is expressly reserved to the Corporation. I suppose that is by the reserving clause which you referred to?—The Tyne Improvement Commissioners take nothing but what they take by this Act, and out of what they take by this Act is expressly reserved the soil to the Corporation.

3339. Just let that clause be read, that it may be upon the minutes?—It is clause 61. " Provided always, and be it enacted, that, subject to the liabilities on the Corporation by " this Act expressly imposed, this Act or anything therein contained shall not take away, " lessen, prejudice, alter, or affect any estate, right, or interest whatsoever of the Corpo- " ration of, in, or to the soil of the port and river, or lessen or prejudice any of the estates, " lands, property, and effects of the Corporation, or any of the tolls, rates, duse, duties, " rents, issues, profits, or other income whatsoever of or payable to the Corporation; or " any of the powers, authorities, franchises, customs, usages, immunities, rights, or privi- " leges of the Corporation."

3340. Then the operation of that clause is, that if the Corporation had any property in the soil of the river they have it still?—Yes.

3341. Have the Corporation any property, or have they ever claimed to have any property, in the soil of the river, excepting as Conservators?—Decidedly so. They claimed it as grantees of the soil.

3342. (*Mr. Armstrong.*) From the Crown?—From the Crown.

3343. (*Mr. Webster.*) I understand you to say, then, that the Corporation have always claimed and still claim to be owners of the fundus or soil of the river, as grantees from the Crown?—They do.

3344. Of the whole river?—They make exceptions in favour of those parties who have prior grants from the Crown.

3345. I think that was a matter upon which you gave evidence at considerable length in the Committee of the House of Commons in 1849?—I have no doubt I did. I would state then as I state now, that the Corporation for the last 200 years have not exercised the right except for the protection of the landowners against other claimants. In former days it was otherwise.

3346. At all events, for the least 200 years there has really been no exercise of rights excepting what may be called Conservancy rights?—As against the landowners.

3347. The exercise of rights as against the landowners has been strictly of Conservancy rights?—The Corporation have protected the landowners by their title against the claim of the Crown.

3348. The Corporation are the owners of considerable portions of property on the foreshore?—They are, of very large property.

3349. For instance, looking at that large chart, are they the owners of Smith's Quay, down in Shield's harbour?—No.

3350. Is Willington the first?—Willington is their estate.

3351. Then you go up Walker new quay?—Walker is another estate of theirs.

3352. And there are other estates up the river?—There are.

3353. There is an estate immediately below Bill Point; what is the name of that?—That is part of the Walker estate; Bill Point belongs to the Corporation.

3354. But immediately below Bill Point is an estate which has now become a valuable estate I believe?—It always was a valuable estate.

3355. At all events these were estates made intosolid land out of the foreshore?—The Walker estate contains 1,000 acres; the foreshore is of trifling extent.

J. Clayton, Esq.

30th January 1855.

3356. This frontage, so to speak, for instance, the spots marked yellow upon that large plan at Willington and Walker, and some of the other plots, were plots made by the Corporation, probably within your memory or within the last ten years, out of the fore-shore?—The Walker estate we will speak of first in going down the river. The shores are chiefly let to tenants upon leases, who have built quays. They had very good water frontages, and were going on very pleasantly, until the Conservators came and made their river walls in front of them, and this operation gave rise to heavy claims of damages upon the Corporation as Conservators by their own lessees. And I may say that it would have been more profitable to the Corporation and to their lessees never to have seen those changes of shore upon their estate which now must take place.

3357. That is another question.—I merely wish to deliver the Corporation from the charge of having used their powers as Conservators to benefit their own property, because I am quite sure they had no such view.

3358. Whatever may have been the view, is it not the fact that many thousands of river funds have been expended, the result of which has been the making of land, of which the Corporation enjoy the benefit?—No.

3359. Willington, for instance?—I do not suppose that many thousands of river funds have been spent there. Taking Walker, as I explained to you, I think the evil exceeds the good which the Corporation have obtained there. At Willington I think there is some benefit. At Walker the Corporation and their lessees had a good river frontage and plenty of land behind it. It is not the land alone which gives the value, it is the river frontage, and they had the river frontage before; therefore, what was before agricultural land had all the advantage of the river frontage. It is not to their advantage to buy land at the cost of the new river frontage, because to build a proper quay there will cost 5*l.* a foot running.

3360. (*Mr. Armstrong.*) The quays at Walker were built before by the lessees?—Yes. Going down to Willington, which is next, the Corporation had devoted that estate to the reception of ballast, and the ballast hill approached so near to the shore that I have no doubt there will be some benefit to them from the ground taken from the river by means of the river works.

3361. (*Mr. Webster.*) I presume that this land, when made into solid land, no matter at whose expense, is very valuable land?—No doubt it is; it is made valuable by its river frontage.

3362. As regards Walker, I think you say that your tenants there have sustained injury from the river works?—Yes; we have paid a good deal of money, and have more to pay, I am afraid.

3363. As regards Walker?—Yes.

3364. Have you any property between Walker and Bill Point?—Bill Point is upon the Walker estate.

3365. Then when you speak of Walker you include Bill Point?—Clearly; Walker is a very large estate.

3366. What is the extent of it in river frontage?—Mr. Brooks will be able to give that probably.

(*Mr. Brooks.*) The total river frontage of the Corporation property is about 2 miles.

(*Mr. Clayton.*) It is altogether nearly two miles; Walker and Willington we will put together.

3367. (*Mr. Webster.*) At Bill Point, which we have heard a good deal about, there was a considerable expense incurred by the late Corporation in removing a point of land, was there not?—Yes, in order to improve the sight of the ships going down the river.

3368. I suppose it was river funds expended upon that?—It was done out of the general funds of the Corporation; there was no separation at that day.

3369. (*Chairman.*) That was before 1850, in short?—Yes.

3370. (*Mr. Webster.*) You have told us that you had considerable money to pay as regards Walker and the tenants of Walker from the effect of river works. Would not the effect of Bill Point have been, if it had been taken off, probably, to increase the shoaling on that Walker estate?—I do not think so. We should have been glad to have seen it taken off, and the Corporation would have allowed the Commissioners, without any compensation to them, to do as they pleased with it.

3371. Then how comes it that it has not been taken off?—Because it is exceedingly expensive, working rock under water, as engineers will tell you.

3372. It was a question of cost, which the river funds could not well bear?—I do not say they could not well bear it; they did not think it expedient to expend the money then for that purpose.

3373. Since that time Mr. Brooks has placed jetties, beginning under the old Corporation, which extend the point, so to speak, further westward?—Which makes it less important to have it removed; that seems to me to be the effect.

3374. So that the result of Mr. Brooks' engineering, beginning under the old Corporation, then going on under the Conservators, and continuing down to the present time, has been to extend Bill Point further up instead of removing it?—No, it alters the channel.

3375. It renders it unnecessary in your opinion?—I think it not so necessary as it was before.

3376. You have said that as regards this question of licences, you should have thought

it inexpedient for the Commissioners to grant any formal licences?—I should do it with great care. If a formal licence were required from the Commissioners, I should submit it to the consideration of counsel.

3377. The danger which you anticipate would be a claim under such licences for protection against the 46th of George III., which is a special Act, relating to nuisances in rivers?—I would rather say against a common law indictment for a nuisance.

3378. And also the special provisions of the 46th of George III.?—Yes.

3379. What is the nature of those provisions?—They require one month's notice to be given to the Admiralty of all encroachments; having received that notice, the Admiralty are on the same footing as the rest of Her Majesty's subjects; they may indict or not as they please.

3380. That was an Act whereby the Admiralty obtained notice of encroachments in tidal rivers?—Yes.

3381. Did the Corporation, the old Conservators, also take the same cautious step?—No, they had an interest in the soil, which made it, perhaps, more proper that they should grant the licence; but still their licences were very carefully framed.

3382. Can you favour us with a sight of one of those licences?—I can send for one.

3383. Will you do so?—I will.

3384. Just name one?—I would rather not from memory; but you shall have a licence.

3385. Do they differ in form?—At different periods they would, because they have been framed more carefully in latter times. I altered the old form at one period.

3386. Then perhaps you will give us the old form and the altered form?—I will give you both.

3387. Do the Conservators take these licences, or become possessed of any of these licences?—They have often referred to them; they have always had them when they needed them.

(*Mr. Armstrong.*) Is there not a clause reserving the right of the lessees under the Corporation, that this last Act of Parliament shall not affect them?

(*Mr. Webster.*) I do not know, Sir.

(*Mr. Seymour.*) There is a general saving clause:—"Be it enacted, that except as is by "this Act expressly enacted, this Act, or anything therein contained, shall not defeat, "lessen, prejudice, alter, or affect the rights and privileges of any of the freemen of the "borough, or any of the lessees and grantees of the Corporation, or any other person."

3388. (*Mr. Webster.*) But no questions have as yet arisen as to these licences which have been granted, as between those claiming under the old Conservators and the new Conservators?—I do not remember any. I have frequently had to refer to the old licences for the new Conservators, and they have always had access to everything in the possession of the Corporation.

3389. As to the ballast licences, have you one of those here?—You mean the ballast licences granted by the Corporation, the former Conservators?

3390. Yes?—I have not one of them here.

3391. (*Mr. Armstrong.*) Is the ballast licence by the old Corporation to allow their lessees to deposit ballast upon the Corporation land?—Or upon any land. Where the Corporation have the land, they grant, as upon the Walker Estate and upon Willington, a licence to individuals to deliver the ballast and deposit it on the land.

3392. So to use that land?—Yes. At South Shields, where it is very important to have a great delivery of ballast, because there is an immense shipment of coal there from the Durham coal field, they granted a licence to Mr. Salmon and also to those from whom Messrs. Swinburn and Company derive title. They made the best bargain they could with those parties, they providing the land.

3393. (*Mr. Webster.*) Have the present Conservators granted any ballast licence?—The only case which I recollect is that to Messrs. Palmer to fill up that small portion.

3394. Is that a licence in writing?—No, it merely stands in the order book of the Commissioners.

3395. Then, in fact, no licence is granted to them?—No.

3396. Have not Messrs. Salmon and Swinburn 11*d.* a ton?—One has 10*d.* and the other 11½*d.*

3397. They receive those sums of 10*d.* and 11½*d.* from the present Conservators?—Yes, out of the due of 16*d.*

3398. The Corporation used to pay that to them, I suppose, in olden time?—They did under existing contracts, which are saved by the Act of 1850.

3399. The ballast licence to Messrs. Swinburn and to Mr. Salmon is probably of considerable standing?—That to Messrs. Swinburn and Company is, I think, as far back as the year 1760; Mr. Salmon's is within the last twenty years.

3400. I should hope they have been very profitable licences?—I dare say they have been fairly so, both of the establishments requiring a large capital to establish and work them.

3401. And there has been a good return upon them?—I hope so.

3402. There is no doubt of their having been profitable licences?—I do not think they have made an extravagant profit by them, but I hope they have had a reasonable profit, as every man ought to do who embarks capital in trade.

3403. In the only licence which you have granted, namely, to Messrs. Palmer, do you

J. Clayton, Esq.

30th January 1855.

know what they were to receive?—I really do not know, it is not in my department. The treasurer can tell you what they are paid.

3404. You can tell us what the Corporation are paid; you have told us, I think, 8*d.*?—I have only looked at the published accounts; you can see by the published accounts.

3405. Taking your examination back in the order in which it came, you told us, in connexion with that Minute of the 19th December, in which it was ordered that the wall should be taken down, that fifteen tons of chalk had been deposited by accident, nobody ever knew how. Can you give any explanation of that?—I cannot. I do not attend the Commissioners on their views, only at their meetings. This matter is without the scope of the duty of the legal adviser

3406. Is it within the knowledge of the legal adviser that fifteen tons of chalk were deposited?—No.

3407. You enjoy the office of clerk?—That is a legal office under the Act of Parliament.

3408. There is no secretary?—The accountant acts as secretary to committees and attends committees.

3409. It appears upon that Minute that fifteen tons of chalk were dealt with by accident; in the letter of the Messrs. Palmer, of the 7th of September, they stated that there had been some arrangements prior to the establishment of your Board; what did that refer to?—I cannot speak to any arrangement. I think it is extremely probable that, before the design of the Hay Hole Docks was conceived, Mr. Brooks' plan, to avoid the great loss which we should sustain by adopting Rennie's line there, was to advance the southern shore; and I have no doubt he would hold out to the parties on the southern shore that they would have the advantage of greater space; that if they would let him shallow their water it would ultimately become land. But I am not cognizant of any distinct arrangement between them and the Conservators.

3410. But at that time the deep-water channel was wholly on the north shore, I think?—It was chiefly so, but those works at Willington were likely to throw it over to the opposite shore. Mr. Brooks, finding that it would shallow these places at the Hay Hole, where upwards of a million tons of coal are shipped, still pursuing Mr. Rennie's principle, alters his lines; but after that alteration is commenced, and before it is carried out, comes the project of the Hay Hole Docks, which restores Mr. Rennie's line.

3411. That shows the state of things as projected in 1849, Hay Hole Dock not having been projected till 1850?—Just so.

3412. The deep-water channel being in 1849 on the north shore, would not any rejection of water from the encroachment of Willington have been a direct benefit to Messrs. Palmer?—I do not wish to go out of my depth; I would rather not have anything to do with engineering.

3413. The channel at that time was upon the north shore at Willington?—I know that the tide swept into the Hay Hole, and they had deep water there.

3414. This letter of the 7th of September, from Messrs. Palmer to the Commissioners, was called for in consequence of a discussion which had arisen at the meetings of the Commissioners, as to whether the grant of land had extended to some twenty acres instead of five, I think?—So I understood; I was not present at that meeting, and therefore cannot speak to it.

3415. Did you not think it any part of your duty, when they referred, in justification of their application for the twenty acres, or the larger extent, to an arrangement which had been come to prior to the establishmeut of the Conservancy Board, to inquire into what that was?—I knew there was no arrangement by which the Conservators were bound at all.

3416. That is to say, you knew that there had been no arrangement with the Corporation?—There could not have been such an arrangement without my knowing it, though they would naturally expect to get the increased space, produced by changing the channel, if it were carried out.

3417. Then this representation which they made, as justifying this extended claim in equity, had no foundation?—I had no cognizance of it as the officer of the late Corporation; it had not assumed any legal shape.

3418. Assuming that the effect of the projection at Willington, and the works upon the north side, should have been to send the deep water over to Messrs. Palmer, that of course would have been an improvement of their water frontage?—It depends upon whether it was deep enough before. I really cannot answer engineering questions.

3419. Is this within your knowledge, though not an engineer, that a deep-water frontage on the Tyne is more valuable than a shallow one?—I think that is obvious.

3420. This was a plan prepared by Mr. Bell, of Higham Place, Newcastle, as the agent of Messrs. Palmer?—So it appears.

3421. Your account is, that they having applied to you on the 8th April, you requested them to furnish a plan?—Yes; I read that from the Minutes.

3422. Where did this plan come from?—Mr. Brooks must answer that.

3423. Whose property is this? does this belong to the Conservators?—It was prepared by Messrs. Palmer, and delivered by them, and therefore will belong to them.

2424. Have you no plan at all, among the records of the Conservators, of this land which Messrs. Palmer, or Messrs. Ellison, or Messrs. Leslie are entitled to take?—It is not in my department.

3425. You do not know of any?—I know nothing of it.

3426. On the occasion of the 20th of October 1852, when this licence as you say was granted to Messrs. Palmer to deposit ballast, was not it resisted by Captain Purdo and Mr. Stevenson?—I have no record of it.

3427. Is it the practice at the meetings of the Commissioners that a resolution should be disposed of by a show of hands?—Sometimes; but in all important matters the names are taken down; any individual has a right to require the names to be taken down.

3428. Would it be quite consistent with your experience of what takes place at the meetings of the Commissioners that Messrs. Purdo and Stevenson and others might have objected to the ballast licence to Messrs. Palmer, but that no record of their having done so should appear upon the Minutes?—If they moved no amendment, it might be so.

3429. It appears that there was a view subsequent to the 8th of April, but that no resolution was come to with reference to that view, or to the grant of land to which it related?—I do not attend views, and therefore cannot say what passes at them.

3430. On the 13th of May the application related to making a jetty upon the line agreed to at the view of the 20th of April?—Yes.

3431. But there is no record upon the Minutes of the Commissioners as to the results of that view; you have not read any?—I have not. I have read what I find; I do not attend views, and therefore I cannot give evidence to what passes at them.

3432. On the 27th of January Mr. Brooks, upon reference to that plan, reports that it is 5-$\frac{9}{10}$ acres?—Yes, which is confined to the land in front of Mr. Brown's land.

3433. And then, I think, a discussion arose in which Mr. Philipson took a part, as the solicitor of Messrs. Palmer, whether, in point of fact, it did not extend to nearly 20 acres?—I was not present at any such discussion.

(*Chairman.*) Will not you get all this better from the Chairman of the Tyne Improvement Commissioners, than from Mr. Clayton, who was not present.

(*Mr. Webster.*) No doubt, Sir.

3434. (*To the Witness.*) On the 20th of July, at page 169, this letter of the majority to Sir James Graham, you say, was carried by 8 to 4; be good enough to tell me who voted upon that motion?—For the motion, the Chairman, Mr. Potts, Mr. Dodds, Mr. Carr, Mr. Ormston, Mr. Ridley, Mr. Rayne, and Mr. Armstrong; and against it, Mr. Straker, Mr. Poppelwell, Mr. Stevenson, and Mr. Purdo.

3435. You have referred to a resolution of the 4th of May, which related to Mr. Leslie's application, was there not a half-tide wall there before Mr. Leslie came?—I do not know; I do not know when Mr. Leslie came.

3436. Is there a half-tide wall there of some standing?—Mr. Brooks will tell you that better than I can.

(*Mr. Brooks.*) There was no wall.

3437. (*Mr. Webster, to Mr. Brooks.*) When Mr. Leslie made this application on the 4th of May, 1854, was there not a half-tide wall?—Not in front of his property.

3538. Was there a full-tide jetty?—There was to the west of his property.

3439. Was not this deposit of mud, of which Mr. Leslie complained, due to that full-tide jetty?—No doubt it would be.

3440. (*To Mr. Clayton.*) You referred to a resolution of the 23d of March, in which you took special pains to comment on Mr. Straker's having voted in the majority?—I did not make any comment.

3441. You took special pains to tell us the fact that he had voted in the majority?—I merely read the proceedings.

3442. I will ask you whether, at a meeting previous to that, there had not been a resolution come to, by which Mr. Brooks, if he considered himself bound by a resolution of the Commissioners, was pledged to leave everything as it was, and not to carry on his full-tide walls?—Mr. Straker has reminded me that Mr. Brooks had been directed to devote his attention exclusively to the preparation of the plans for the piers.

3443. Was there not at that time a resolution in existence, by which it was understood that nothing further would be done, so far as regarded full-tide walls, and that half-tide walls should be tried?—I quite understood that the Commissioners had fully determined to erect on the south shore, to the extent of 2½ miles, a half-tide wall, upon the plan recommended by Mr. Rennie and Mr. Rendel, and to leave the future heightening or not of that wall to the results of experience; and the proprietors of the lands, I stated, had been so polite to them as to allow them to do it.

3444. You have referred to Captain Purdo's motion of the 8th of December 1853, which was passed unanimously, for a return of encroachments?—Yes.

3445. And on the 23d of March, it was disposed of by a motion of Messrs. Carr and Rayne, that the information should not be granted?—That it was useless and ought not to be granted; it was disposed of by 10 votes against 2.

3446. Who is Mr. Rayne?—He is a gentleman concerned in shipping, and one of the representatives of Newcastle in this Commission.

3447. And an Elder Brother in the Trinty House, is he not?—I believe he is; he is a nautical man.

3448. He resides at Newcastle?—He does.

3449. Does Mr. Carr reside at Newcastle also?—No; he resides in the neighbourhood of Newcastle; he is a coalowner on the Tyne, shipping his coals in the bay at the Hayhole near North Shields.

J. Clayton, Esq.

30th January 1855.

3450. You have spoken of plans for the piers with which Messrs. Robinson and Clay waited upon the Lords of the Admiralty in January 1855?—Yes.

3451. Have those plans ever been brought before the Commissioners as a body?—I will look at their Minutes and see. The Piers' Committee, who had the charge of those plans, comprises 11 out of the 18 members of the Commission; and they were unanimous in their adoption.

3452. Do you remember any resolution at a meeting of the Commissioners relating to those plans with which Messrs. Robinson and Clay waited upon the Admiralty?—Messrs. Clay and Robinson were charged with the working drawings and specifications by the Piers' Committee. It appears, on reference to the Minutes, that those working drawings and specifications have not been before the Commissioners. The Piers' Committee were too anxious to save time to allow of unnecessary delay, and they had full power to act.

3453. You have referred to the representations which Captain Linskill has made respecting the resolutions not having been communicated to Mr. Walker?—Yes.

3454. Do you remember the resolution of the 4th of May?—I do.

3455. At what date was that resolution in writing communicated to Mr. Walker?—I cannot tell exactly. I only know that I put a copy of it into his hands in London.

3456. Was that resolution communicated to Mr. Walker at all, either verbally or otherwise, for a very long time after the 4th of May?—Not a long time; a short time.

3457. Did you not understand Captain Linskill's objection to have been, not that you had not communicated the resolutions to Mr. Walker, but that they had not been communicated with for a very long time after they had been passed?—That we had no record of their communication by letter; I think that was the captain's objection.

3458. The resolution to which the captain particularly referred was one of the 29th of September, I think?—I have no doubt the captain intended it, acting as he does with great courtesey, as a reproof to me for not being so prompt as he thought I ought to have been.

3459. Can you account for the fact that five months had elapsed, between the 4th of May and the 29th of September, without the resolution of the 4th of May being carried out?—I can only say that I did all I could to get it carried out.

3460. You have also referred to the proceedings on the part of the deputation with reference to the Harbour of Refuge. I think that was attended by Mr. Cowen, the Chairman?—Yes.

3461. And Mr. Mather, as Commissioner?—Mr. Mather and two or three other gentlemen. We had the benefit of Mr. Robinson's attendance, I think.

3462. I think you were present also?—I was.

3463. Mr Cowen and Mr. Mather made rather powerful addresses on that occasion, did they not?—Very. Both of them, I think, acquitted themselves very creditably as representing the Commission.

3464. Mr. Cowen particularly spoke of the enormous value of the Tyne, and the quantity of shipping coming into it?—Yes; very justly so.

3465. He did not insist upon nine-tenths stopping in Shields Harbour?—No; he knew very well that all who were interested in the trade of the Tyne were interested in the well-being of the shipping in Shields Harbour.

3466. Do you remember Mr. Cardwell saying this,—"You know that there are also "reports which have been laid before Parliament, which point to a sum of money which "had been raised in this very river, the Tyne, and which, instead of being applied for "the purpose of improving the navigation, had been applied to purposes wholly foreign to "that object. For instance, I have in my hand the report of Captain Washington, in "which he speaks of more than half a million of money having been applied to the lighting, "paving, watering, and scavenging of the streets of Newcastle"?—That alludes, of course, to the alleged misappropriation by the Corporation, the former Conservators.

3467. That was one of the reasons assigned by that gentleman against the application, was it not?—He mentioned it, no doubt.

3468. Do you remember Sir James Graham saying also,—"I do not wish to enter into "the more disputed question with regard to the local funds, but still the trade of the "Tyne is great, and the receipts from the shipping in the Tyne are very great, and I do "not think that the whole of those receipts have been applied to the Tyne navigation pur-"poses. There are local funds to a very large amount, which, if they were applied alto-"gether to the benefit of the shipping, would be more than sufficient to meet the whole of "this outlay. However, that is opening a question of local funds, which is much dis-"puted, though still it is not altogether out of the question with reference to this subject"?—Yes; Sir James Graham did so express himself, evidently referring to the same period of time, and the same state of things to which Mr. Cardwell referred.

3469. I believe that state of things still continues, so far as regards a very considerable portion of the funds which the old Corporation enjoyed?—The Corporation took their funds by grant from the Crown, for the support of the town and harbour; but the Act of 1850 has prescribed what part shall go to the town, and what part shall go to the harbour.

3470. What part of the dues levied upon shipping coming into the Tyne do the Corporation still enjoy?—None at all; all that they have retained is five-eighths of an export due of 2*d.* a Newcastle chaldron (2½ tons), payable on coal exported from the Tyne, and

which is, in effect, a tax upon the coalowners. They gave up to the Commission all their dues upon shipping.

3471. Then, when you tell me that it is not a due upon shipping, it is because you say it is a coal-due, or a toll upon goods carried by the shipping, but not upon the shipping itself?—It is an export duty on coal, which is, in effect, paid by the coalowner, because being in competition with other ports where such a duty does not exist, he must use his coals much cheaper.

3472. Then that is a disadvantage, according to your account, which the coalowner shipping in the Tyne experiences?—Yes, but not appreciable, it is so small a tax.

3473. It produces a pretty good revenue, does it not?—Yes, from the enormous trade.

3474. How much does it produce?—In the whole, 12,000*l.*, or 13,000*l.*, or 14,000*l.* a year (the accounts will show), of which the Commissioners have three-eighths.

3475. It would be sufficient in amount to keep the river in a very good state within a few years, I suppose?—I have no doubt of it.

3476. You have referred to the fact of the Hay Hole Dock having been established. Mr. Rendel recommended, I think, a half-tide dock there?—He did, and the coalowners told us that it would be a great mud trap; that they would not be able to ship their coal in it, or to use it for any purpose.

3477. In consequence of what the coalowners told you, and to which you have acceded, is it the fact that they have a full-tide dock instead, without a half-tide dock?—They will have ultimately, and they will pay for it.

3478. No doubt a full-tide dock is a much better thing than a half-tide dock, for the coal owners?—Much better for the trade; it is better for the coal owners and the trade of the port?

3479. Then the result of this difference of opinion from Mr. Rendel and the opinion that his would be a mud trap is, that they have got a full-tide dock instead of a half-tide dock?

(*Mr. Armstrong*). By Act of Parliament?—By Act of Parliament, and without costing the river funds one penny.

3480. (*Mr. Webster.*) I believe when that scheme was brought forward, it was sought to mortgage the river dues?—A clause was put in to enable the Commissioners to charge their share of the coal tax received in that dock as a collateral security for the money required to make the docks; but that was resisted, and we abandoned the clause.

3481. It was resisted by the Shields party, I believe?—It was; they, for some reason or other, did not entirely approve of the clause.

3482. At all events, whatever might have been the reason, what the Shields party did, was to resist the application of the river funds as a security for making this dock for the benefit of the coal owners?—The use of the river funds as a collateral security for the money required to carry out the works.

3483. On the occasion when the ballast due, which the Corporation were to receive, was settled at 8*d.*, did not Mr. Peppelwell move the amendment upon the ground that the Corporation themselves, in certain cases, only paid 4*d.*?—I do not remember the ground.

3484. In point of fact, can the Corporation deposit ballast at 4*d.* a ton?—I do not think they can.

3485. The profit to which you referred, as being made, was a profit of 800*l.* a year, was it not?—I do not know; Mr. Stevenson stated it. I have not ascertained it.

3486. You have referred to the case which was laid before Mr. Cowling; I trust you did not understand me as suggesting that you had not stated the case fully?—No, I am sure you did not.

3487. Is it not perfectly consistent with your experience as Town Clerk, and as Clerk to the Commissioners, that a case which might have been stated on behalf of the shipowners might have led to a very different opinion?—No, I think not; it was a very simple question.

3488. My learned friend has referred to the Bill of 1850, which was introduced, and the print of it, and to Captain Linskill's account. I will ask you whether that clause which exempted the Corporation from the liability, was not introduced on the third reading in the House of Lords?—I do not remember at what period precisely.

3489. Can you tell me at all upon whose authority that advertisement offering the water frontage upon Messrs. Ellison's property was introduced into the paper?—It is an advertisement of Mr. Ellison's land agent to let his land, I believe, occasioned by the establishment of many iron-ship building works on this river.

3490. (*Mr. Armstrong.*) He thought that possibly his land might have privileges, describing them?—Being a great extent of shore, much of it deep water.

3491. It was not to let merely the shore, but the land abutting upon the shore?—Yes, Mr. Ellison has a very large estate there.

3492. (*Mr. Webster.*) That was in September, and what took place with regard to the supposed licence to enclose took place prior to that?—I do not know; I did not observe the date of the advertisement. I observed that it was an advertisement of Mr. Ellison's land-steward.

3493. You told us of the difficulties which would arise with landowners, as to dealing with the river?—I believe in the report which Mr. Rendel laid before you he advised the

J. Clayton, Esq.

30th January 1855.

Corporation, and the report was laid before the Conservators, that it would be essential that compulsory powers should be got to deal with the land owners?—Yes; and if there had been any great number of parties interested in the shore, or but one unreasonable person to deal with, it would have been necessary; we should then have been placed under the Lands Clauses Consolidation Act, and we must have paid the damage which our works, might possibly occasion to every gentleman's property before we commenced those works, or took possession of any part of the soil.

3494. Mr. Brooks referred to you to tell us whether the documents handed in yesterday by him were the whole of Mr. Rendel's Appendix?—I cannot tell.

3495. You received the papers from Mr. Rendel?—I received them, and handed them to Mr. Brooks the engineer.

3496. Have you no account of the number of papers which Mr. Rendel gave you?—No, I did not think it necessary to take any such account; the papers relate to a matter of engineering.

3497. When did you receive them from Mr. Rendel?—I cannot say exactly. We had a very heavy sum to pay to Mr. Randel, and it was some time before we could pay off the balance due to Mr. Rendel; till that was done, we did not press for the papers.

3498. However, as soon as you had received the documents, you handed them to Mr. Brooks?—Yes, it is an engineering matter altogether.

3499. Then the state of the matter, and what has been done, is entirely in Mr. Brooks's hands?—And, perhaps, the Secretary to the Committee's.

3500. Have you supplied the Commissioners with a copy of Mr. Rendel's report?—I believe so, but if they have it not, I will take care that they have it.

(*Chairman.*) We have Mr. Rendel's report.

(*Mr. Webster.*) Mr. Brooks does not seem to know whether the documents put in are the whole of the Appendix, however, probably Mr. Rendel will explain that. There are two reports of Mr. Brooks, Sir, which have been referred to several times; I do not know whether they have been furnished to the Commissioners; a report of Mr. Brooks of July 1851, and also a second report of November 1851.

3501. (*To Mr. Clayton.*) As to a question which I asked you as regards the ballast and the deposit of it, I think there is also an Act of George II. providing that all ballast shall be cast upon the land where the tide never flows?—Yes, you will find that our local Act relieves us from that provision.

3502. That is an Act to which you have referred at different times, when you have been advising the Corporation upon these questions?—I have had occasion to do so.

3503. It has also been referred to in objection to the schemes which have been brought forward for carrying ballast out to sea?—It has.

3504. You have referred to the Life Commissioners?—Yes.

3505. And you have represented that that was a sort of compromise in lieu of the Admiralty clause?—Yes, with the opposers of the bill.

3506. As a matter of fact, I believe one of those Life Commissioners is Mr. Cowen, who acts as Chairman?—Yes.

3507. He resides at Newcastle?—About four or five miles out of Newcastle, up the river, and he has an establishment very near the mouth of the river.

3508. In that arrangement, was he considered as a Newcastle representative?—He was, I think, recommended by the promoters of the bill.

3509. As a Newcastle representative?—Exactly so, if you suppose that the promoters of the bill act for Newcastle.

3510. Another life member is Mr. Hunter?—Yes.

3511. Who, I think, is an influential director of the York, Newcastle, and Berwick Railway?—Yes, he is.

3512. He was also a Newcastle representative?—Yes.

3513. Another life member is Captain Purdo?—Yes, whom we assumed was named by North Shields as a North Shields man.

3514. He was named by the duke, I believe?—I do not know; I was not behind the scenes, Captain Linskill will know.

3515. And there is the only remaining one, the other life member, Mr. Stevenson, who was recommended as a South Shields representative?—Precisely so.

Re-examined by Mr. Seymour.

3516. Are Mr. Stevenson, Mr. Poppelwell, and Mr. Straker active members of the Commission?—Yes.

3517. Was Mr. Hunter a director of the railway at the time he was named as a life member?—I do not recollect; I think not.

3518. As to Captain Purdo, the Duke of Northumberland's nominee, has he not generally opposed the proceedings of the Commissioners?—The captain has a theory, and he supports it very perseveringly.

3519. My learned friend has asked you whether the captain and Mr. Stevenson might not have objected to the permission given to Mr. Palmer to fill up ballast without taking a division, do you think from their ordinary course that if they had objected they would not have divided?—I think they would have divided.

J. Clayton, Esq.

30th January 1855.

3520. You have been asked by my learned friend, with reference to the arrangement with Messrs. Palmer and Mr. Brown, was not that in consideration, as stated in Messrs. Palmer's letter, of the injury to Mr. Brown from the loss of his slip way?—I have no doubt Mr. Brown contemplated getting space of land, as a compensation for and in lieu of the benefit which he lost of the berthage which then existed.

3521. That is stated, I believe, in Messrs. Palmer's letter?—Yes, but as I stated before, I was not cognizant of any specific agreement to that effect.

3522. You told us that the Corporation frontage at Walker was about two miles; to what extent do quays now run along that line?—I cannot tell.

3523. (*Mr. Webster, through the Chairman.*) I believe the Commissioners have not any expenses allowed them for coming to Newcastle?—No.

3524. The meetings are held at Newcastle, but Captain Purdo and others coming from a distance do not get any allowance for expenses?—No.

3525. (*Mr. Armstrong.*) They are not allowed to anybody?—No.

3256. (*Mr. Webster.*) But the meetings are held here?—And occasionally at Shields; the Committees of the Commission meet at Shields very much; a great deal of business is necessarily done by Committees.

3527. (*Captain Fitzroy.*) With reference to an early part of your evidence, as to the objection of landowners to the alteration of the foreshore, does it appear to you that that objection has been, generally speaking, bonâ fide, or raised with a view of getting as much compensation as possible?—Quite bonâ fide. The late Conservators never attempted anything but a full-tide quay, and they induced the landowner to advance his shore to the new river line wherever they could.

3528. (*Mr. Armstrong.*) And to build a quay, if they could get it?—Uniformly they got the landowner to build the quay. The river, as you see, being a perfect hive of industry from one end to the other, and the manufacturer being established upon it with his water frontage, even if you did make the shore deeper opposite his property it was no compensation to him for the disturbance and expense of a new river frontage, therefore it was difficult to get persons to come forward and adopt a new line.

3529. (*Captain Fitzroy.*) Looking at the great difference between shallow water in front of a river-side property, and deep water in front of a river-side property, would not an alteration of the river frontage, from shoal water to deep water, be in some cases advantageous to the owner of that property?—In some cases I can conceive that it is worth the expense of it, but it depends upon the sort of craft that is in the habit of resorting to that part of the shore and the business carried on upon it.

3530. The charge for depositing ballast upon those shores has been the same in all cases, it has been a certain charge of so much a ton?—The Commissioners receive a ballast due of 16*d.* a ton for receiving and depositing ballast, and they pay out of that receipt as little as they can for getting the duty performed in different parts of the river. Some of the parties who receive and deposit ballast have expended a large capital on their establishments; for example, Mr. Salmon, one of the ballast lessees under the late Conservators at South Shields, has, I believe, expended a capital of 10,000*l.* and upwards upon the faith of a lease which was granted him, with liberty to deliver ballast for a certain number of years, he taking it away and finding a depôt, and receiving from the Commissioners for the performance of that duty a specified payment.

3531. The place to which the ballast is taken from the ship's side in no way affects the the shipowner, does it?—No, he pays the 16*d.* per ton to the Commissioners, and the Commissioners get it delivered by their lessees.

3532. If another party were at liberty to take that ballast from the ship's side and carry it away, it would make no difference to the shipowner; it does not matter to the shipowner who takes the ballast, provided the ballast goes away?—Not at all, except that it is desirable, if possible, that it should be delivered, both for expedition and safety, without the intervention of river craft, and therefore if the shipmaster can go up to the ballast machine and have the ballast taken out of the hold, it is better for all parties; but where you cannot do that, you are obliged to take it out of the ship and put it in keels or lighters, and carry it to a ballast depôt.

3533. If other parties than the Commissioners can by convenient means carry away the ballast and put the shipowner to the expense of only 6*d.* a ton for so doing, will it not be more advantageous to the shipowners generally?—Clearly, but then the Commissioners would not get their due; you suppose that the shipowner gets his ballast delivered without reference to the Commissioners at the cheapest rate that is practicable.

3534. Yes.—The proposal of Messrs. Stevenson, which is in evidence, showed at what price ballast could be taken out in hoppers and delivered at sea, viz. at 11*d.* per ton.

3535. A great part of the revenue of the Commissioners for the purposes of the River Tyne is derived at present from the ballast?—Yes; you will see from the accounts that there is a considerable profit accruing to them from the delivery of ballast.

3536. Looking to an increase of iron-shipping, and any alteration that may take place in the mode of ballasting coal ships; looking to the possibility of water being used as ballast in some cases, will not a large proportion of the revenue of the Commissioners be liable to be diminished?—Clearly so; if there is less ballast for them to receive, their profit will be less; and if water ballast be substituted, the shipowner relieves himself of his ballast without payment to any one.

J. Clayton, Esq.

30th January 1855.

3537. Supposing the question to be thrown open to public competition as to the carrying away of ballast from the ships, would shipowners be able to depend upon a constant and cheap means of removing the ballast from their ships?—I am not able to say that they would.

3538. With reference to the construction of the Hay Hole Docks, it was stated that a certain amount of interest was to be paid out of capital?—Yes, interest upon the money raised for the purpose of the works upon the security of the dock dues. Of course, there is no fund but the capital to pay it until the docks are open for traffic, and therefore it is paid out of capital till the docks are opened.

3539. Did not Lord Campbell, some three or four years ago, give an opinion to the effect that the payment of interest out of capital was illegal?—We have a clause in our Act of Parliament to enable us to do so, which would override Lord Campbell's decision, inasmuch as the Legislature is omnipotent.

3540. At present, I believe there is one dredger in the river?—Yes.

3541. Is that vessel worked by steam?—Yes.

3542. Would it be, in your opinion, too great a demand upon the funds of the Commission to employ two dredgers?—I am afraid it would. They are building a second, but I think they will find that the employment of two will be a very costly proceeding; a second is building on a larger scale than the present dredger, and we hope that the improvement in the channel of the river may be so great that we shall not have need of employing two dredgers, though the Commissioners will be in possession of two as soon as the large one, which is now constructing, is completed.

3543. Dredging away the upper parts of the banks above low-water level being so very important, as admitted on all hands, would it not tend very much to the prevention of differences of opinion, not to say disputes, if two dredgers could be kept going continually at the same time, one in the upper part of the river, and the other in the lower part of the river, so that the harbours, properly speaking, about Shields might be in process of improvement at the same time that the upper part of the river was in process of improvement?—Two dredgers would, of course, do more good than one, and would give more satisfaction.

3544. It is at present a question of expense?—It is.

3545. It did not appear, I think, from reference to the Minute Book of the proceedings of the Commissioners, what was the result of the resolution proposed by Captain Purdo, and consented to by the Commission, that a return should be given of the alteration made in the state of the river by certain groins and embankments or half-tide walls. The return was agreed to, but it did not appear, as far as I could gather, what was the result of it?—Then at a subsequent meeting it was resolved, by a majority of 10 to 2, that such a return would be of no use, and ought not to be furnished.

3546. Was that the termination of the question?—It was.

3547. That such a return was of no use?—Yes.

3548. Being an engineering question, I presume you would not give an opinion as to its value?—Not at all; it is quite out of my department to give an opinion upon such a question.

3549. The words of the motion were that such a resolution could be of no value, and ought not to be passed?—Yes; it was a return merely of the acreage, without reference to depth at all, taken from the bed of the Tyne below high-water mark since 1840.

3550. Turning to the last letter from the Admiralty, reading only the last two paragraphs, the Secretary of the Admiralty writing, says, with reference to the piers:—"I am "further directed to recall your attention to the basis of the agreement, that by the em- "ployment of an engineer of great standing in his profession, it was intended to throw the "whole responsibility of the work on him, as a guarantee to all other parties interested; "and that his skill and judgment should not be confined to the mere outline of the piers, "but be equally applied to the construction, viz., that Mr. Walker should be responsible "for the working plans, the description of material used, and the specification of work "and its execution. Their Lordships do not perceive that Mr. Walker has been consulted "or has approved of the works, for which the Admiralty assent is now asked; but unless "that be the case, Mr. Walker's responsibility in his own plans will be entirely lost, and "there will be no guarantee to the Lords Commissioners of the Admiralty, or to the "general interests of the Tyne, that the work will be successfully carried out; or in case "of failure of the works, where the responsibility would rest. Their Lordships therefore "trust, that the engineer who designed the works will be enabled to see them carried out "on the details which he conceives necessary to their success and safety." As I understand that letter, it appears to me that the Admiralty desire that the former agreement that Mr. Walker should undertake the superintendence of the whole works, should be adhered to and carried out?—If you look at the context of the former arrangement, you will see that it is confined to fixing the plan of the works. We now come to the execution of them. The Commissioners have arranged with Mr. Walker that he shall be their consulting engineer; the Admiralty seem to wish for something more, and I think it is probable that a satisfactory arrangement may be made between the Commissioners and the Admiralty within a short time.

3551. In this letter, the Admiralty state positively, that the agreement was "that Mr. "Walker should be responsible for the working plans, the description of material, the speci-

" fication of work, and its execution"?—You will find the agreement stated in Mr. Walker's report, and does not extend to those particulars.

3552. Then the Admiralty statement must be incorrect?—It is inacurate according to our construction of the agreement.

3553. It appears to me, according to this letter, that the whole question of the piers (a most important question for every interest on the Tyne) is now in abeyance, on account of the appointment of an engineer, and not on account of any financial difference?—Not at all; there is some difficulty of arrangement as to the engineering.

3554. The stumblingblock is solely the appointment of an engineer?—I think so.

3555. In paying Messrs. Salmon and Swinburn 10*d.* or 11½*d.* a ton for the ballast taken out by them and deposited at Shields, what reason is to be given for their being able to take out ballast and carry it away so much more cheaply than the Commissioners; they taking away this ballast at 10*d.* or 11½*d.* and the Commissioners charging 16*d.*? The difference is the Commissioners' profit: it is a revenue to the Commissioners; they receive the 16*d.*, and they pay Mr. Salmon and Messrs. Swinburn and Company, one of them 11½*d.* and the other 10*d.*, for discharging the duty for which the Commissioners receive 16*d.*, and the difference is the profit of the Commissioners, and is part of their revenue.

3556. Then how is that profit applied?—It goes to the general fund of the Commissioners.

3557. To the general works upon the river?—The general works upon the river.

3558. Does the whole of the sum received by the Commissioners in respect of the river go to the improvement of the river?—Yes, to their general purposes; it will go partly for interest of debt, as their accounts will show.

3559. It all goes directly or indirectly to the river?—It all goes to the purposes of the river.

3560. No part of this difference between 10*d.* or 11½*d.* and 16*d.* goes to Newcastle solely?—No, it goes to the Commission generally, for the purposes of the river.

3561. In the meeting of the deputation with Sir James Graham and Mr. Cardwell in the early part of last year, there appears to have been a misunderstanding as to the state and management of the funds; the impression upon Sir James Graham's mind and Mr. Cardwell's, as it appears in the account, having been formed from the management in times past, rather than in times present?—Palpably formed upon evidence of the state of things previous to the Act of 1850.

3562. Supposing that the present state of the financial question were put before them clearly, is it obvious to you that their view would be expressed differently?—I think they would like to have the work executed without our coming to Government for money. They say that they have only assisted places where the trade is small and the means trifling, but they see that the trade here is enormous, and the means great, and that a slight tax upon that trade will produce a very large sum. In conversation, I think we collected that this was one of the feelings which influenced them.

3563. They think that a special due or a special tax ought to be levied on the banks of the Tyne and its neighbourhood, for the purpose of erecting these piers rather than charging the public in general by the assistance of public taxes?—Yes; they would evidently prefer having it done out of the Commissioners' funds to having it done out of the public taxes.

3564. To what particular quarter do they look for this fund?—I think to a small tax upon shipping. The number of ships is so enormous, foreign and British, frequenting this port, that a very small tax raises a very large sum.

3565. Meaning an additional tax?—A continuation and addition.

3566. Not referring to taxes or dues now in existence?—I think not, because you will see what our means are: we apprehend that they would not be adequate to a very large expenditure, and we hope that by adopting the notion of the Admiralty, that on the south side of the harbour it is unnecessary to make more than a rough breakwater, the expense will be brought within our means.

3567. What may be in round numbers the total revenue of the Corporation of Newcastle at the present moment?—They publish their accounts, which speak for themselves (*taking up a printed account*). The five eighths of the coal duty is an important item in their revenue. Isee in this account, it produces them 8,700*l.* in round numbers. The rents of their estates 8,400*l.*: the rents of markets about 3,009*l.*; their tolls 3,540*l.*; but these are more than absorbed by the duty attached to those tolls; they must be considered as producing less than nothing, because more than the whole is expended. Then the rest of their income is made up of rates upon the town.

3568. Speaking in round numbers, it does not exceed 30,000*l.* a year?—The total receipts in this year, that I have before me, which is 1852 to 1853, including rates and every sort of income, are 37,984*l.*

3569. Of which a very large proportion goes in indispensable disbursements?—It does a great deal of it; they have to sustain all the expenses of a county. Newcastle is a county of itself.

3570. The total gross revenue of the Corporation not exceeding 37,000*l.* a year, could any great works, requiring from 200,000*l.* to 400,000*l.* or 500,000*l.* expenditure, be undertaken out of a portion of that revenue, considering the other demands upon it?—No; it is already exhausted by necessary payments.

J. Clayton, Esq.

30th January 1855.

3571. If any great national work, such as the piers at the mouth of the river, requiring from 200,000*l.* to 500,000*l.* or 600,000*l.* were undertaken, would they not become a benefit to the country at large? would they not afford a harbour of refuge for men-of-war as well as for merchant shipping, and foreign shipping also?—I have no donbt of it at all; it is a most important national undertaking.

3572. Is there any place between the Humber and the Firth of Forth where a harbour of refuge on a great scale could be constructed more advantageously than at the mouth of the river Tyne?—I believe not.

3573. If such a harbour were constructed, would it tend to the general advantage of Shields, as well as Newcastle and all the neighbourhood?—It would be to the benefit and advantage of the whole district.

3574. In the first instance?—In the first instance.

3575. And of the country at large, in the second?—Precisely so.

3576. Of foreigners passing along the coast?—Most important for them.

3577. And the defence of the country in case of a war with any of the north-eastern maritime powers, there being no other place for ships of war to resort to on this coast between the Forth and the Humber?—In that view it would be, I think, very important.

3578. Is not a very large proportion of the trade of Great Britain carried on along the coast of Durham and Northumberland?—A very large proportion.

3579. In case of a war with Russia or France, would not that trade require special protection for a great extent of coast?—It would.

3580. Is there any port now between the Forth and the Humber in which such ships intended to protect the trade can lie, or to which they can run in case of bad weather?—None.

3581. Then, in your opinion, there is a strong claim upon national assistance in the execution of the piers at the mouth of this harbour?—I truly think so.

3582. Are you aware that there is a remarkable correspondence between the views of the engineer employed for many years past by the Corporation, and the views of the most eminent engineers who have been consulted on the subject of the improvement of the Tyne since the beginning of this century, such as Mr. Rennie, Sir William Cubitt, Mr. Robert Stephenson, Mr. Richardson, and others?—It appears to me that there is a decided correspondence, so far as I can judge of the subject.

3583. I believe all parties have concurred in attaching great weight to Mr. Rennie's opinions?—Yes.

3584. Mr. Rennie says in his report, "Although a great extent of space to receive tide "water is essential to the preservation of a good outfall, it must be observed that the most "advantageous space for the reception of this tide water is not the surface exclusively, "which is in a considerable degree the case with the Tyne, where there are large sand-"banks which are not covered with water until nearly half-flood, after which the water "has not so great an effect in scouring the bottom as at an earlier period of the flow: the "like takes place in the ebb. In the Tyne the sand-banks ars so numerous and high, that "the flood is far advanced before they are covered with water, and therefore the current of "the tide is sluggish; and besides, the numerous eddies in the river greatly obstruct the "flow. In like manner, one half of ebb is fallen off before the sand-banks are dry, and "by the time it should be the greatest, its scouring force is in a great measure gone by, "there being little water left in the river. Were these sand-banks removed, and had the "tide free ingress, it would flow with more rapidity in the first quarter of the flood, and in "like manner it would return with more rapidity in the last quarter of the ebb, so that in "both cases it would scour with more force, and make and maintain a greater depth of "water. The time for which vessels could navigate the river would likewise be pro-"longed, and they would sooner get to their berths when inward bound, and in like "manner would proceed down the river and get to sea before so much of the ebb was "spent. To effect this essential improvement, I propose that the river shall be contracted "in its wide places into a narrower channel, and in places where the width is already too "small it shall be enlarged. In doing these the curves must be made as uniform as the "nature of the shores will admit, and that wherever there are any abrupt projecting points "which materially obstruct the current, these points shall be cut off. The lines of con-"traction laid down by me are not, however, regular; they are always wider where the "turns are, and in general the river has been laid out of a greater width where the greatest "number of vessels generally lie, in order that proper room may be afforded for others to "pass and repass them: and as vessels which lie in the river to take on board cargoes not "only occupy considerable space, but also occasion eddies, there is more space required "for the tide-water to pass them than in places where vessels do not generally lie. It is "possible, however, that experience may prove that these spaces should be still further "contracted. The mode of contracting the river, where required, I propose to be the same "as that practised in the river Clyde, which, with the addition to the plan suggested by "me about eight or ten years ago, has proved so very successful, namely, by building "jetties from each shore, and moving the sand and gravel out of the intended channel by "means of dredges, and depositing it in the spaces between the jetties; and when the "channel was brought near to the depth it was expected the water would maintain, these "jetties have been joined by walls of rubble stone, whereby the channel has been pre-"served of a regular depth. Without these junction walls this could not have been done,

J. Clayton, Esq.

30th January 1855.

" as the water would have spread between the points of the jetties and thrown up sand-
" banks, which would thus have rendered the channel full of shoals. By the line of jetties
" laid down by me, the surface of the channel, supposing the tide to be contained within
" these points, will be reduced to about 896 acres, namely 448 acres less than it now is at
" high water." That was in 1813. " Now the question is, how shall this deficiency of
" tide water, occasioned by the contraction, be supplied? Towards the supply of this de-
" ficiency there are several sand-banks in the channel of the river, which are now dry at
" three-quarters ebb, and there are others which are nearly dry at half ebb. Of the
" former are those of Jarrow Sands, amounting to about 21 acres, and of the latter are
" Cock's Crow Sand, and several others, amounting to about 52 acres, making together
" about 73 acres, which will be reduced to a depth occasionally under low water. In addi-
" tion to this I have to remark, that the river throughout (I mean the contracted channel)
" will be very much deepened, and consequently the low water will be depressed in its
" surface, and as the flood tide will be much less obstructed, it will flow further up the
" Tyne, and rise higher than it now does; and as it will receive the tide-water in the first
" quarter of flood, and will retain this water until the last quarter of ebb, it will produce
" a much greater effect in scouring the bar in proportion to its quantity than it now does;
" and in addition to all these, it is proposed that the height of the jetties shall little exceed
" the height of half flood, so that a principal part of the space embanked will still remain
" as a receptacle for tide water. According to this plan, therefore, the scouring effect of
" the tide will be materially increased, and consequently the depth of water over the bar
" will be increased to the depth, I apprehend, of at least two feet. The narrowing the
" river by means of jetties is the most economical mode I can devise, and best suited to
" the circumstances of the case, for that part of the river which lies between Shields and
" Newcastle; but for the whole length of Shields and most of Newcastle, I am of opinion
" the contraction should be made by regular wharf walls of masonry; and as the space
" gained will prove highly beneficial to the proprietors of property bordering on the river,
" I cannot for a moment doubt that they will be ready to make an allowance for the
" ground gained, if not to undertake the work at their own expense. In some parts of
" the river the channel will require to be widened, such as at White Hill Point, at Bill
" Point, at Hall and Company's Lead Smelting Works, at St. Anthony's Village, at Felling
" Shore Copperas Works, at Cinder Kilns, at Friar's Ballast Hills and opposite the
" Northumberland Glass-houses, at the head of the Glass-house Reach. By the cutting off
" of these projections, the tide-water will meet with much less interruption in its flow, and
" the freshes of the river will meet with less interruption in going off, and spread more
" regularly over the channel, so as to scour away the sand-banks which now lie irregularly
" in the river, and thereby make and maintain a more uniform depth of water." I only read that part, long as the extract is, with the view of asking you whether the substance of Mr. Rennie's advice being brought to your immediate recollection, you think that the engineer employed for many years past by the Corporation has endeavoured to carry out, as far as local difficulties connected with the owning of property on the shores have admitted, the views advocated by Mr. Rennie in 1813?—I believe so.

(*Mr. Seymour.*) Would you refer, Sir, to the last sentence, as to the order in which the works are to be done, as it will make the analogy complete?

(*Captain Fitzroy.*) " Where the channel of the river is to be materially changed, it should
" be done gradually, for if it were done otherwise, the sudden effect produced would
" greatly impede the navigation. The new proposed wharf walls in Shields may also
" stand over for some time to come, unless the proprietors of the property on the borders
" of the harbour think it advisable to commence upon them at an early period, which it
" would be their interest to do. The works that strike me as most material to be done
" first are those which tend to direct the river in a straight, or at least a uniform course,
" where it is most interrupted by sand banks. The effect of such works will be sooner
" felt there or in other places where the channel is not so bad, and the pier on the Herd
" Sand is a material object. On this subject, however, I shall be more particular, should
" my plan be determined on to be carried into execution."

3585. (*Mr. Armstrong.*) You have stated to us the income of the Corporation, part of which arises from rates on the inhabitants of the town of Newcastle?—Yes.

3586. And you have said that the whole, or nearly the whole of that is expended for public local purposes in the town. If you were called upon to contribute any additional sum for additional works, would you not have to replace that by additional rates upon the inhabitants?—Yes.

3587. You have no other way of doing it?—No.

(*Mr. Webster.*) There are three letters, Sir, relating to the piers, which have not been put in, of the 22d of April, the 11th of May, and the 18th of May.

3588. (*Chairman, to Mr. Clayton.*) You will be so good as to let us have those afterwards?

(*Mr. Clayton.*) Certainly; I have put in such as seemed material; I wished to embarrass the Commissioners as little as possible with unnecessary matter.

(*Mr. Seymour.*) My instructions are, Sir, to give every facility.

J. Cowen, Esq.

30th January 1855.

JOSEPH COWEN, Esquire, sworn.

Examined by Mr. Seymour.

3589. You are Chairman of the River Tyne Improvement Commission?—I am.

3590. I believe you are a coalowner and fire-brick manufacturer?—I am.

3591. And you carry on your business some distance above Newcastle Bridge?—I do.

3592. Have you also an establishment where you carry on your business below in the river near Shields?—Yes, at Jarrow Quay.

3593. Did you attend the Admiralty Inquiry of Messrs. Lawes and Abernethy, in 1850?—I did.

3594. Were you also before the Committee of the House of Commons?—I was.

3595. We understand that the Act of 1850, with the exception of the appointment of the Commissioners, which was made by the Committee of the House of Commons, was a compromise between Shields and Newcastle, and the parties representing them?—It was not only a compromise between Shields and Newcastle, but it was also a compromise with the public generally, more especially with the landed proprietors, whom I had at that time taken some interest in representing. I may state that on reference to the Blue Book it will be seen that in the Inquiry before Messrs. Lawes and Abernethy, I took a considerable interest in getting a representative part of the body for the parties west of Newcastle Bridge. I attended here before the Inspectors at that time, and examined a great number of witnesses. I afterwards attended before the Committee of the House of Commons in support of a petition signed by Lord Ravensworth, Sir Thomas Clavering, and all the other landed proprietors, with the view that if there was to be a change in the representation of the Tyne, it was right and fair that they should be represented as well as the Borough of Newcastle and the parties at the mouth of the river. I did so with as much effect as I could under the circumstances, and to the very last I persevered in representing to the Committee of the House of Commons my views upon that subject. At last I was induced to do what everybody else did, namely, to accept the bill as it now is, as a compromise between the whole parties.

3596. The bill having passed, and the Commission having been constituted under it, what was the first measure which you supported?—I might under these circumstances state, that we westward of Newcastle Bridge entertained a feeling in preference for the bill brought into Parliament by the Corporation of Newcastle, upon this ground, that it proposed certain new works to be done in all parts of the river, as well above bridge as below bridge. The bill which was brought in by the parties at Shields, I think I am right in saying that it was by the Corporation of Tynemouth, at any rate the bill brought in by the parties at the mouth of the river did not propose any new works. When before the Committee of the House of Commons, being forcibly struck with all that took place there, the proposed new works were struck out of the bill upon this ground, that it would be better to appoint a commission, and to let the commission after they were appointed consider, and I would also say re-consider, what were the measures which they ought to carry out, and having determined upon what was necessary to be done, that they should then go to Parliament for powers to do it. The Committee of the House of Commons at that time thought that that was the better plan, and I entirely concurred in it. You have asked me what I did. Now the first thing I did was this; having it fresh in my mind, and having been appointed a life Commissioner, being desirous, so far as I could to carry out the views of the Committee, which I believe were based upon the best information which could at that time be given, and which I believe were very proper and just; the first thing I did was to recommend to the Commission to go to Parliament for a comprehensive measure to comprise the whole river from the Bar to Hedwin Streams; to get an Act of Parliament to deal with the whole. Now as it has been already stated to you, and as you will see, twelve months elapsed before we could get Mr. Randel's report: consequently during the whole of that time we were as it were thrown upon our beam ends. I had had many opportunities of considering well what was the best thing to be done during that time; therefore, I had formed a strong impression that it was right we should have a measure for the whole river; however no resolution was passed; we talked over the thing at that time a little more friendly than we have latterly done, and after discussing the matter fully it was agreed, and I thought very properly agreed, that we should not go to Parliament for so sweeping a measure, but for an Act to make the piers, which we unanimously agreed was the best work to commence with, and next to that the Hay Hole Docks. I quite concurred in that, and especially as there appeared to me to be a feature, which I think has hardly been sufficiently brought before the Commissioners, with respect to the Hay Hole Dock, because, be it remembered that the Hay Hole Dock, without, as it has been said by Mr. Clayton, trenching upon the funds of the Commission, will become as it were the public property; it will become the same as the river Tyne. I may not live, nor perhaps may any of us live to see it, but it will not be a great number of years, if the rapidity of the increase in shipping coal goes on, before it will become a free dock, with the exception of keeping it in repair. I therefore said that those were the two most important measures for which we should go Parliament. Entertaining the views which I do, that measures in the western part of the river would be productive of great benefit in the eastern part, I very strongly advocated that we should include the improvements west of Newcastle Bridge. I recollect very well that my friend Mr. Philipson, who was then in the Commission, thought I ought

to give way and not to press the measure at all. I did so very willingly, seeing that these were the things which ought to be done, and others as well as Mr. Philipson thought it was time enough to consider what was to be done above bridge at some future period.

3597. The piers and the Hay Hole Dock are both in the Borough of Tynemouth?—They are.

3598. Some inquiries have been made as to removing Friar's Goose Point and Bill Point, and White Hill Point; can you offer any reasons why nothing was done to either of those Points?—The reason is perfectly obvious; the fact is, we had not the money, however much we might be disposed to do it. It is all well enough for the learned gentlemen or for anybody else to talk about removing these points; it may be very desirable, and I will not dispute it, but we had no means at our disposal to do it; and I think it is well for it to be mentioned that our legal expenses have been about 18,000*l.*, and all these things have had to be provided for. It is true we have borrowed the money, but we have paid a great deal out of capital, and we have really not had any money to do it. I think it is desirable that Friar's Goose Point, and Bill Point, and White Hill Point, should be removed; but I would beg to remark that I entirely concur in what has been said with respect to White Hill Point by Mr. Ure, the engineer of the Clyde, that however desirable it may be at some subsequent period of our proceedings to remove that point, it would be a very unwise proceeding at the present time. The docks at Hay Hole and the docks at Jarrow both pending, and considering the immense amount of property there is at the south or south-west end of South Shields which would be thrown into entirely shoal water or sustain an immense injury, there would be no corresponding advantage derived from taking off that point; therefore I say it may at some subsequent period, when these docks are made, be a matter which not only would be desirable, but which might be accomplished with satisfaction to all parties, but at present I think it is one of those points that ought fairly and reasonably to be deferred.

3599. It has been observed, that accommodation should be made for ships near the sea; what is your opinion as to ships getting up the river?—I fully concur in the great necessity which there is to make accommodation for the ships near the sea; there cannot be any doubt of it at all; and I think I shall, at a subsequent part of the proceedings, show the great desire which there is on the part of the Commissioners that that should be the case, when I speak a little more about the funds; but we ought to take a comprehensive view of this river entirely; we are the Conservators from Hedwin Streams to the bar. I know I am liable to have it said that I live in the western part of the river; it is true I do, but it must always be remembered that the whole of my business, the whole of what I may say I have to depend upon in this world comparatively, except what may have been realized, has to come down this river. I am therefore very deeply interested in it from its highest points to its lowest points, and I have tried to deal with it in my own mind as an entire measure; and whilst I would prepare, in the first place, certainly for the most ample accommodation of the people of Shields, I see no reason whatever to despair, if we could do away with Tyne bridge or make a new Tyne bridge so as to pass ships through it, of our having docks of considerable magnitude much higher up the river than where we are sitting. There is far more likelihood of that than there was of the people of Glasgow getting their ships up where they were trying. Therefore, during the time of my being in the Commission, while I have attempted to be as conciliatory as possible to the opposition, I have wished to look at the whole thing as an entire matter.

3600. Regarding the interests and position of the coal owners and manufacturers upon the Tyne, do you consider them interested in Shields harbour especially, or in Newcastle equally; is either interest paramount?—If the shipowners will pardon my views, which I have expressed before, I do not wish, and I am sure the Chairman will give me credit, when I say that nothing would pain me more than to give offence to any class of men or any man; but I think there is a mistaken notion on the part of the shipowners as to their position in this matter. At any rate, the coal owners and the manufacturers of the river Tyne are equally if not more interested than the shipowner. I do not like to use terms which I have seen in this book, but I may elucidate it perhaps in the most straightforward manner that I can. I say that the shipowners are the common carriers for the producers of the Tyne; it may be an offensive term, I do not mean it so, but that is the fact of the case, and they cannot alter it. A shipowner with his ship can come into Shields harbour, or can go elsewhere, and he comes into Shields harbour just so long as it answers his purpose to come into that harbour; because if it pays him better to go to London, to Liverpool, Glasgow, Dundee, Edinburgh, or Perth, he does so, and does not come to Newcastle. And if we could dissect the thing, which time has not allowed the opportunity for, or it has not been thought about, (perhaps it would be difficult,) it would be found that the Shields shipowner is the vehicle of carriage for a limited proportion of the produce out of the Tyne. You will easily see that the same thing by no means applies to the manufacturers. We have coal owners (and I am not sure that there are not some in this room) who have their 20,000*l.*, 30,000*l.*, 50,000*l.*, 100,000*l.*, 200,000*l.*, or 300,000*l.* invested in collieries; and I have seen some parties here at any rate, if not in the room to-day, whom I could name, that have similar sums in manufactories. Now, the plant of these men is fixed; it is local, it is stationary, it cannot be removed. Then I ask, in the shape of common sense, who are interested in this great navigation? why these men? because if you can get the coals for 6*d.* a ton less freight out of this river in consequence of putting it into a better state of

J. Cowen, Esq.

30th January 1855.

navigation, these men can send their coals better to market; the thing is very clear. I say we have all of us an unanimous interest, and it is to be regretted that we should have any difference of opinion.

3601. You have all an equal interest, I presume, in the deepening of the bar?—There cannot be any doubt of it. I think there is a difference probably in that respect, that the people of Newcastle are more interested in the deepening of the bar than the people of Shields. It has been observed to you before, that if a vessel goes from here, especially if she has a great draught of water, she goes away a little before high water; but however good the river is, before she can get to the bar the tide has fallen a good deal. Now that does not apply to Shields at all, because they can go out just at the time of top high water, and they are right out to the sea. Therefore, I say, the people in the western reaches of the river are decidedly more interested; at least when I say more, I do not want to draw any distinction of interests: I want to show, if I can, that we are all equally interested in this great navigation.

3602. With regard to Messrs. Palmer's enclosure, were you one of the Commissioners who went to the view upon that day of which we have heard mention made, to see where the line was going to extend upon Messrs. Palmer's property?—I was.

3603. Was Mr. Stevenson there?—Yes; and Captain Purdo was there too.

3604. Was the course you determined on objected to by anyone?—So far as my memory serves me, nobody objected to it at all.

3605. Are the enclosures of Messrs. Palmer and Messrs. Leslie the only enclosures which have been authorized by the Commissioners?—The only ones that have been authorized by the Commissioners that I know of or recollect.

3606. In your opinion, were they done in accordance with the proposed river lines?—Certainly so. Whatever may have been said, I should wish, so far as I am concerned, to impress upon the Chairman of this Commission, with regard to the plans which have been exhibited here, that especially that large plan has been at the service of every Commissioner, and has been brought to us upon every meeting, so far as I can recollect, (and I have no doubt I am correct,) when we discussed any point that was worthy of having reference to a plan at all.

3607. Were the lines which were observed in those works suggested or adopted at the recommendation of the Shields Commissioners,—the question refers to Mr. Leslie's case?—I do not know Mr. Leslie, nor anything about him. I understand he is a stranger. I never saw the man, and I have heard nothing about him; but I remember, if my memory serves me rightly, that Mr. Straker came to the Commissioners' meeting and stated that he had come up in the train with him or somebody connected with him, or had heard something about him, and urged upon us the propriety of doing what Mr. Leslie wanted. I will not say that that was doing what is exactly now shown upon the plan, but at any rate it was doing something that Mr. Straker thought right to be done. I forget now exactly what took place, but we were all so desirous of giving encouragement to a new man like Mr. Leslie to come and locate himself upon the banks of the Tyne to build iron ships, that I believe we were quite unanimous in giving him every facility. I see laid upon the table a plan subsequent to that, signed by me, which is what we agreed to. I should wish it to be understood that in so signing any of those plans I have never done it without saying to the Commissioners: Now, Gentlemen, this is the line, or this is what you have agreed to be done.

3608. Has there been access by any member of the Commission to any plans in the possession of the Commission, or of their servant, the engineer, at any time?—At any time and at all times. When I have had occasion to go to the engineer's office, I was always overdone with plans that I asked for, or wished to see. The Council Chamber, where we meet, is downstairs; Mr. Brooks' office is upstairs. If anybody talks about a plan, you have seen enough of Mr. Brooks here to say that he is very quick; he either runs upstairs or sends somebody, and the plan is down in a very short time. I think if Mr. Stevenson did not open out the plans it really was his own fault.

3609. He had every facility?—He had.

3610. Captain Purdo, I understand, made a great many motions with respect to the river; did he always get a fair and full hearing at the Board?—Captain Purdo always got a fair and full hearing at the Board. In all his motions which he has ever brought before the Board, I have felt, since I have been chairman especially, and during all the time that I have been there, that Captain Purdo's age and position demanded that he should be respected, and I may mention (and I believe the gallant Captain will state if he hears me) that I have very often allowed him to make two or three speeches when he should only have made one.

3611. The River Lines Committee, I believe, have agreed to river lines from Shields to Newcastle?—They have, and I should say that that is only pending the present Inquiry, because so far as I know the river lines, I am not aware that we have any difference of opinion. We have met and have gone over them all the way to Newcastle Bridge, and they were brought before the Commissioners' meeting, but it was thought that it would be more desirable to have the plans drawn, showing the lines that we had agreed to, and showing, I think, Mr. Brooks' lines and Mr. Rennie's lines. I think there are three. I expect I am speaking correctly.

(*Mr. Brooks.*) Two lines.

(*Mr. Cowen.*) That matter is completed, and it has only been delayed in consequence of the meeting of the Royal Commissioners; we have to make a short report along with that plan. We have no difference of opinion, so far as I know, upon what is to be done.

3612. (*Mr. Seymour.*) Do you remember the majority and minority, as my learned friend has termed them, meeting on the 15th of June, on laying the foundation stone of the piers?—Yes.

3613. I believe there was a very pleasant meeting?—Yes.

3614. Were you aware at that time that the letter of the 3d of June had been written to the Admiralty by the minority?—No. I will give a little history of that, because I think it should go forth to the public, to show the good feeling, whatever may be said to the contrary, which has at all times existed on the part of the people in the western reaches of the river towards those at the lower end. I was in London in the months of May and June with Mr. Clayton and Mr. Clay, endeavouring to get the Admiralty signature to the plans, of which Mr. Clayton has given you such a lucid explanation. I attended there every day for a great many days with Mr. Clayton, and also again with Mr. Clay. They both left town and left me before the thing was completed. There was not the slightest disposition on the part of the Admiralty to protract what we were doing; but it was just about the time when Sir Charles Napier was going out to the Baltic, and of course they were beset every day in the office with numbers of people, so that it caused a little delay before we got the matter finished. I attended there on the 1st or 2d of June; the document had been sent down to Mr. Clayton the night before; they were either to send it to me in London, or I asked them to send it down to Mr. Clayton. This was on the 1st or 2d of June. We were then all on the most friendly terms, and in order to show the desire which was evinced in that quarter to assist us, if they were not I should say misled by garbled and unfair statements, I may mention that I there saw Captain Washington, who shook hands with me, and said, "I assure you we wish well to the Tyne, anything that "can be done here we shall be most happy to do for you." I also parted with Captain Vetch on the 1st or 2d of June, and the memorable letter, if you recollect, was signed on the 3d of June. I said that it was an important work which we were going to make; upon which Captain Vetch said, "It is, and if we have any plans or any information in this "office that we can show you or hand to you, they are at your service; we shall be most "happy to do so." I expressed an idea which I then had, that I should be in London the following month of July or August, and that it might be desirable to go and look at some places of the kind. He immediately fell in with the view; he said, "I think it will be one "of the most desirable things that your body can do, to make yourselves acquainted with "similar works, and I shall be most happy to accompany you to Portsmouth or Plymouth, "or Dover, or to any of those places, if you will come up to London and will let me know." I left Captain Vetch with the distinct understanding that I would be there at that time, and would accompany him. The circumstances of which you have heard already too much then took place. I have been in London, but I did not call on Captain Vetch. What I have just stated was on the 2d of June, I believe. On the 3d of June this letter is written. On the 15th of June we had to lay the foundation stone of the piers, and I may remark that none of us knew, at least I did not know on that day when we were laying the foundation stone of these piers, that such a letter was in existence. We had probably one of the greatest days that we shall ever have in the Tyne, and I did really think that I not only laid the foundation stone of the piers, but that I had laid the foundation stone of a long unanimity of feeling amongst the good folks on the Tyne. We had speeches before dinner, and we had speeches after dinner. The worthy Mayor of Tynemouth gave us a very sumptuous dinner, and we drank success, I believe, to the Port of the Tyne; we thought we were going to be united again, and that all things would be as they had been. In a few days this letter came out. I would observe at this part of the proceeding that that letter, which was signed by me on behalf of the Board, was written under feelings a little disappointed, at any rate, at the conduct which we had met with from that party.

3615. You said that before you closed your examination, you would like to give some evidence with respect to your financial condition; perhaps it will be convenient to do so now?—With respect to the funds, in order to show the desire that we have to do the best we can for the harbour of Shields, we have a mooring fund which provides, by a separate tax upon the shipping, for putting down moorings. I think in round numbers the amount of that fund is about 1,800*l.* or 2,000*l.* a year; but the true position of it, at the present moment, is this; in fact, it is a farthing a ton upon the shipping, and one third of it goes to the police fund, and two-thirds to the moorings. It is insufficient to meet the expense of putting down the new moorings. The year before the present one, I see there is a balance of the money which we lent to that fund, of 872*l.* 12*s.* 5*d.*; that is, a portion of the general funds of the river applied to putting down moorings, principally in Shields harbour, for the purpose of affording greater facilities to shipping. During the present year, that is, the year ending the 31st December, the accounts are not yet made up, therefore they cannot be handed to the Commissioners in a sufficient state; but I believe it will be found that we have expended from our general revenue on that fund 2,057*l.*, and I believe I am right in stating that we are going on now with new works of that description which will incur 4,000*l.*, and which will consequently draw from our general revenue next year 2,000*l* more. Now you are surprised at what becomes of our money, and how little has gone to the improvement of the river; only 2,000*l.* has been applied to the improve-

J. Cowen, Esq.
30th January 1855.

ment of the river, certainly; but I have had the question of the moorings pressed upon me by some of my friends who are shipowners, and I have given the thing my greatest support, although it was coming out of the general revenue of the Tyne, upon which the moorings fund had no claim. I considered it a very excellent appropriation of our general fund, and especially with the view that we should satisfy, if possible, any claims from the parties at the eastern end of the river. With respect to the piers, it has been, I think, complained of by the learned gentleman, or some of the witnesses on his side, that we have done comparatively nothing. Now last year we just about expended the whole of our revenue. Our revenue, I believe, will turn out to be 10,000*l.* or 11,000*l.*; we have paid 6,000*l.* to the Dean and Chapter of Durham for 36 acres of land, and we are under contract for about 5,000*l.* for making a railway to begin the piers; so that, instead of doing nothing, we have last year expended just about the amount of our revenue.

3616. Do you agree with the opinion which has been expressed, that the land is worth 1,000*l.* an acre?—Not that, certainly. There is another matter connected with our accounts, and that is the Jarrow Docks. In supporting the Jarrow Docks, believing as I did, and those who acted with me, that they would be of very great importance to the Tyne, and especially of great importance to the people at South Shields, the first thing that I desired to look at was, what the financial position of it would be, and being, as I say, a coal owner myself, and having some little idea of the inconveniences that frequently arise from want of sufficient accommodation in shipping coals, I am aware of the difficulties of a matter of that sort; in fact, I know that the North-eastern Railway Company had not the means of shipping anything like the quantity of coals that they could have done without this dock. On making some little inquiry, I found that on a moderate calculation, within say three or five years of the formation of these docks, we should ship half a million of tons of coals in the river Tyne more than we should, in all probability, if there was no likelihood of a dock at all; and when I came to put it into figures, I made it out, that with the coal dues and with the pier dues, we, as River Tyne Commissioners, should get better than 2,000*l.* a year, irrespective of all other things. Being convinced that no harm would result to the river from what was going to be taken from Jarrow Slake, or, in fact, from closing up Jarrow Slake altogether, I said that I was, at any rate, as the Chairman of this Commission, bound to support these docks, and upon that ground I have done so. There is another thing, namely, that if this dock had not been about to be formed, and this accommodation obtained, the great probability is that the bulk of these coals would have gone to Sunderland; that is, the extra quantity of coals which would otherwise come here. I would remark, that there has been a great deal of talk about the constitution of the Board. Now, though I do not agree with my friend Mr. Straker, who has been, I think, a very efficient member of our Board, that we should bring anybody up from below, at any rate, to manage it, yet having taken the part which I previously have on behalf of the owners of property, I venture to offer the opinion that, at the present moment, any attempt to alter the constitution would be a matter attended with considerable inconvenience and expense. Should there be an attempt to do that, I have no hesitation in saying that every landed proprietor on the banks of the Tyne, from Hedwin Streams to Shields, would oppose any alteration in the bill unless they got a fair proportion of representatives.

3617. (*Mr. Armstrong.*) An alteration of what bill are you speaking of?—The Conservancy Bill. I take one object of the present Commission to be to consider the constitution of our Board. I am aware, from living in the country, of the feeling of the parties, and there would be a determination on the part of the landed proprietors, amounting to something beyond what I believe my friends at the mouth of the river calculate upon, to get a fair representation of the whole parties from one end of the river to the other. In my view of the question (of course I do not say I am right), there can be nothing unreasonable, and no impropriety in such men as the Duke of Northumberland, and such men as Mr. Ellison, of whom you have heard so much, who have such large estates, thinking that they have a fair right to be represented in this Commission. I maintain that it is the legitimate way in which the thing ought to be done, if there is to be a change; but these men are not seeking for any change. I believe they would say, that at the present early stage of our Commission, it would be a very impolitic measure to take.

3618. (*Mr. Seymour.*) In your opinion, as a whole, has the Commission worked well and efficiently, or not?—I think it has worked well; I not only think so but I feel it; I think it has worked quite as well as anybody could reasonably expect; and my own view of it is, that the greatest benefit which can be conferred upon it is to leave it and its officers alone. If they are not interfered with, I have not the slighest hesitation in saying that the Commission as now composed will accomplish all that anyone can fairly expect from it. Allow me to make a single other remark: I would just observe, if it is not going out of the way, that Captain Linskill talked about our proceedings in committees and their not being fairly reported. That is not fair; it is rather libelling the Board or the constitution to talk about them in that way, because we have committee meetings, and at these committee meetings resolutions are passed; we do not make long speeches. We have parties of somewhat an ardent temperament, who have rather a passion for public speaking: we do not do that at committee meetings. But the Captain can see all those things at any time when he has a mind to ask for them. In order to show that if he were on the

committees, and if he were to attend, he would get a more general knowledge of what was going on; I may state that I was absent sixteen days last month. I see I had notice to attend nine different meetings. I was in London during that time; I have no doubt that if I had been at home I should have been at every one of those meetings. I do not think Captain Linskill would have been; I do not charge him with meaning anything disrespectful either to myself or any member of the Commission; of that I am quite sure; but if he were at more of those meetings than he has been, he would have a more general notion of how the matter was going on. A good deal has been said about one-tenth of the cargoes of vessels that come into the river. If I had been sitting here as an individual who did not understand that question, I should have been led to suppose that only one-tenth of the cargoes coming into Shields harbour was consumed or used by the people of Newcastle. Now I believe the reverse of that to be exactly the case. It will turn out that about one-tenth of the whole produce coming into the Tyne is used and consumed in the two boroughs at the mouth of the Tyne.

3619. The remainder swells the trade of Newcastle?—It comes up to Newcastle. With respect to our revenue, I would say, that taking the financial statement of last year, and seeing what the auditors have reported, we have exceeded our revenue 2,000*l.* at least; but I believe when it is wound up to the 31st of December, it will be found that we had rather a good year last year. I see our dredging the year before was 4,641*l.*; 2 251*l.* for river improvements; 64*l.* for small expenses; moorings I see stated at 2,057*l.*; 1,700*l.* for a steam-tug in connexion with our dredging; our law expenses were 7,120*l.*; 5,000*l.* of that we borrowed. Therefore there were 2,000*l.* for law charges, 1,700*l.* for a steam-tug, and 2,000*l.* for moorings. There are things totally irrespective as it were of our regular charges upon the river.

3620. With regard to those law charges, they are for the whole expenses of former bills?—Yes.

3621. (*Mr. Armstrong.*) You were in debt upon that particular score?—We were paying off the debt; I believe we have now paid off all our legal charges, amounting to somewhere about 18,000*l.* There is just one other matter upon which I would make a remark, which is this: I have no connexion whatever with the Corporation of Newcastle; I have no place in it; I have not, that I know of, even a vote at Newcastle for the councillors. I have officers at Newcastle, but only within the last few years. My place of business is chiefly five or six miles up the country, and therefore I have no connexion, either directly or indirectly, with the Corporation of Newcastle.

Cross-examined by Mr. Webster.

3622. Did you understand, when it was represented that $\frac{9}{10}$ths stopped in the boroughs of Tynemouth and South Shields, and $\frac{1}{10}$th came up here, that they were speaking of cargoes?—I did.

3623. Then it was not so, it was tonnage. Do not you know it to be one of the great grievances against which the Shields people have complained, that by reason of the great influence and monopoly at this end of the river, the cargoes are obliged to come up the river, although they are consigned to Shields parties?—I do not know it of my own knowledge, but I have heard that they do so; but I have heard that the people of Shields complain of many things which I can mention.

3624. Do not you know that you the Commissioners and the Newcastle party have on every occasion opposed the construction of quays at North Shields?—No; I must decidedly deny that we have ever done anything of the kind.

3625. Was not there a Quay Bill in 1850?—It was in the same year as we became Conservators quays were awarded to it.

3626. Do not you know that in the Session of 1850 there was a bill for constructing quays down at North Shields, which was reported upon by Mr. Rendell, and which was adopted by the Admiralty, but which was compelled to be reduced to one-half in width and in length by reason of the opposition of the Corporation of Newcastle?—No, I do not know that. I know that there was a strong feeling on the part of the Commissioners (there were some subsequent matters upon the subject of that quay), to afford the people of Shields every facility.

3627. As a matter of fact, at the present moment, is there a single quay for discharging goods at either of the Shields', excepting a low-water quay belonging to his Grace the Duke of Northumberland?—What I understand about the quay at Shields is this: there was a bill got in 1850——

3628. I am asking you the fact. As a matter of fact, is there, at the present moment, at either of the Shields', a single quay at which goods can be discharged, excepting a very small one belonging to his Grace the Duke of Northumberland, and that a low-water quay?—I really do not know the number of quays in South Shields.

3629. Then do you say that you personally have taken no part in the opposition which the Shields people have experienced in endeavouring to get quays at Shields?—Certainly not, and never will do so; they shall have my support in every matter in giving them facilities.

3630. As regards the Commission which you have spoken to, and over which you preside, there is no doubt that this end of the river has the majority of votes?—That depends very much upon the question which comes before the board.

J. Cowen, Esq.

30th January 1855.

3631. As a matter of fact, as it is now constituted, out of the eighteen commissioners, are there not ten whose place of business is entirely at this end of the river?—I know no difference from one end of the river to the other. I never have viewed it, and never shall view it, in any other way than as an entire measure. That is the only answer which I can give to the question, because there is not any such notion or feeling with the people, even in Newcastle.

3632. As regards the Jarrow Docks, do you mean to represent that the opposition which was raised to that was an opposition to docks, and was not simply confined to the necessity for some compensation in respect to tidal water?—Yes, I am bound to believe that is so, and if you will allow me I will tell you the reason why. There has been a great deal of discussion about that, and we need not disguise the fact that the cause of the Royal Commission is neither more nor less than the Jarrow Docks.

3633. That is your assertion in the memorial?—That is our assertion in the memorial, and I have good reason for believing it. I do not know whether my gallant friend Captain Purdo is here or not, but there are many people in the room who, I have no doubt, would prove what I am stating, if it were necessary. Captain Purdo stated to me, in our meeting room, "If I had got Mr. Rendel's diagrams, Jarrow Docks never would "have been made." Now I wanted no further explanation as to what Captain Purdo's motive was, because his object was to prevent the docks being made, so I concluded.

3634. According to the scheme which was sanctioned last year, and which was, as you say, promoted and supported by the York, Newcastle, and Berwick Railway Company, I believe they obtained power over 350 acres of land, did they not?—I do not recollect the number of acres.

3635. A very large space of land?—Not 350 acres, that is the whole amount of the slake.

3636. But a very considerable portion?—Yes.

3637. On a preceding occasion there had been a scheme for docks, when the quantity taken was much less, I think?—I believe there had.

3638. Was not the opposition of the Admiralty, and of those who acted with Captain Purdo, founded solely on the absence of necessity for their taking a larger quantity of land than they had done on the former occasion?—I confess that I have come to a different conclusion, that it was not founded upon that, and I will state the reasons for it. I dislike to be invidious, but having heard what I have now done from Captain Purdo, I cannot disguise from my mind what his object was. Now I am sure Mr. Stevenson will pardon me when I state his peculiar position in the matter. I have not seen the bill since it was passed, but there are either fifteen or seventeen clauses in the bill to protect Mr. Stevenson's works from the operations of this dock. Mr. Stevenson says five, perhaps it may only be five. Now Captain Purdo residing at Sunderland, and remembering, as I have said before, that if this quantity of coals was not shipped at the Jarrow Dock it would most certainly be shipped at Sunderland, and Mr. Stevenson, as the plan will show, having his works within the space where the dock would be made, these are matters in which these gentlemen lay themselves open to suspicion (I do not mean to say that it is so) in the minds of the public as to the motives which have actuated them in the steps which they have taken about the Jarrow Dock.

(*Chairman.*) However, as the Jarrow Docks are now law, the Act of Parliament having passed last year, is it worth while to go into all the bygones about them, who opposed and who supported?

(*Mr. Webster.*) You must remember that this gentleman introduced it, Sir, into his evidence.

(*Mr. Armstrong.*) It has been introduced from the commencement of the matter.

(*Mr. Seymour.*) You started it in your speech.

(*Mr. Cowen.*) There is another question, and it is this part of it. Mr. Webster asked me, I believe, whether I did not think that the quantity proposed before was sufficient for the docks.

3639. (*Mr. Webster.*) No, I did not ask you that. I asked you whether the opposition made by the Admiralty was not in consequence of the increase. You personally approve of the Jarrow Docks?—I do.

3640. You have spoken about the expenditure which has been already made in respect of the piers. Upon whose authority was that made?—Of the Commissioners.

3641. Was it upon the advice of Mr. Walker at all?—It was upon the advice of the Commissioners, as to purchasing the land under the power which they had under the Act of Parliament, and as to carrying a railway from where the stone is to be had to the piers; it is upon the authority of the Commissioners, and not of Mr. Walker, or anybody else. I wish it to be understood, that I have no objection to Mr. Walker; these were legitimate expenses, which must have taken place under any circumstances.

3642. (*Mr. Armstrong.*) It is only something preparatory?—Just so.

3643. (*Mr. Webster.*) In the purchase of this land for stone, and the expenditure which you have already incurred, was Mr. Walker consulted?—Yes, and he went down and saw the works. I believe he saw the stone.

3644. Have the Commissioners had any report before them from any professional person, in respect of the expenditure which they have already incurred for the piers?—I really do not know what you mean, unless you mean that the Commissioners had no judgment,

or anything at all of their own, as to whether or not they were to buy 36 acres of rock, which were certain to be required for these piers, and to form a railway, without which we could not go on with the piers. If it is necessary to get the report of any particular person upon that, then I will say our whole functions must be at an end.

3645. Then, that expenditure was incurred upon the authority of the Commissioners themselves?—Undoubtedly.

3646. Or rather the Piers Committee, I suppose?—No, the Piers Committee do nothing themselves, that they do not bring before the next meeting of the Board.

3647. You have told us that you have had three river lines, Mr. Rennie's Mr. Brooks', and Mr. Rendel's, I think?—No, I said, I believed there were three; that this plan which is to be laid before us is to contain two or three lines, and in distinct colours; so that we can in our report to the Commissioners show which colour is that which we recommend to be continued up to Newcastle Bridge.

3648. Was not the report of Mr. Brooks, of July 1851, accompanied by a chart with river lines?—Yes.

3649. (*To Mr. Brooks.*) Has that been put in?—Yes, it was put in a long while ago.

3650. That is marked "Rendel and Brooks." If yours has been put in, has Mr. Rendel's been put in?—Yes.

(*Mr. Cowen.*) I would explain with respect to this matter, that every Commissioner has a copy of these plans, and I have examined them again and again, whenever we have had anything to do at the meeting, and I have not been satisfied with what has been done; I have gone home at night or in leisure hours, and laid out the plans and examined them.

3651. You have said, that during the inquiry now pending, the River Lines Committee have agreed to lines?—Certainly not. I tell you, as may be readily supposed, that Mr. Brooks has had to prepare some matters connected with this Royal Commission. It was the desire on the part of the majority, that every information in every respect that we could give, should be laid before the Commission which was coming down here; therefore, anything that Mr. Brooks could do, since we knew that we had a Royal Commission, was to be done to get the thing brought fairly before us.

3652. There have been two River Lines Committees, have there not; one Mr. Robinson's, and one yours?—We have always had one, so far as I recollect; it has been a continuous Committee.

3653. When was the last meeting of the River Lines Committee?—I cannot speak to that; it may be perhaps two months ago, or it may be three. I see in 1852, the following gentlemen were on the River Lines Committee. Mr. William Hunter, myself, Mr. James Cochrane Stevenson, Captain Purdo, Mr. John Robinson, Mr. Stephen Lowry, and Mr. Matthew Poppelwell. So far as I know, the same Committee has been continued ever since; we are re-appointed every year.

3654. Has it been a River Lines Committee for the purpose of settling what lines should be adapted as each work proceeded, or has it been a River Lines Committee for the purpose of selecting one of those two plans, either Mr. Rennie's or Mr. Brooks', by which your works should be carried on?—It has been a River Lines Committee for the purpose of selecting from these plans the lines which they, in their judgment, considered would be the most advantageous for the river to be carried out.

3655. (*Chairman.*) You have said "they." I do not quite understand whether you meant the River Commissioners?—Certainly.

3656. (*Mr. Webster.*) I want to know again, (you have not answered the question,) whether you have ever, as a Committee, adopted either Mr. Rendel's or Mr. Brooks' system of river lines as a whole?—I do not know that we have.

3657. Has not what you have done been this; that when application has been made for any particular work to be done, as for instance, that of Messrs. Palmer, you have then considered what should be the river line at that particular place?—No, we have not considered what the line should be at that particular place, but we have considered what the line should be above and below that place; we have had Mr. Brooks' plan, and Mr. Rendel's plan, and Mr. Rennie's plan, generally laid before us, and we have determined generally which we thought it should be, having reference to the place, and above and below, and also to a general line for the river.

3658. (*Chairman.*) As I understand you, you have not thought yourselves bound to adhere strictly and blindly to any particular line, but according to the best of your judgment, you have framed your line according to existing circumstances?—We have, having reference to those particular plans, and deviating as little as possible from those lines; in fact, no case I know of, except the case of Messrs. Palmer, and there we deviated in consequence of the Hay Hole Docks, from what appeared to be the general line of the river.

3659. (*Mr. Webster.*) Then what you have done has been this; when an application has been made to you, as in the case of Messrs. Palmer, you have then considered what should be the river lines at that point, in reference of course to the place immediately above and below it?—If none have been laid down at all, certainly.

3660. Have you settled any river lines on the plan below Hay Hill Point?—On the plan to which I have alluded, a line was drawn as to which I believe there was no difference of opinion in the River Lines Committee.

3661. That was Mr. Brooks' plan of 1843, was not it?—It was upon his plan; there

J. Cowen, Esq.

30th January 1855.

were some places where there was probably some little deviation, but that I believe was trifling.

3662. Just look at that large map on the wall. Do you see Smith's new quay? that is in Shields harbour, is it not?—I fancy it is.

3663. You know the Coble Dean opening, do not you?—Yes.

3664. And the White Hill Point?—Yes.

3665. Smith's new quay is an existing quay, is it not?—I believe so, I cannot say.

3666. Are you not aware, as appears in the evidence upon some of the Inquiries, that the proprietors of that quay are under an engagement to the old Corporation and the present Conservators to advance it out as far as Mr. Rennie's line?—No, I know nothing about it.

3667. You never heard of that before?—Not before this Inquiry.

3668. Then you do not know that that is contained both in the Inquiry before Captain Washington and in the Inquiry on the North Shields Quay Act of 1850?—I have read Captain Washington's report all through, but I do not know the thing.

3669. Will you be so good as to tell me, as regards these river lines which you say you have agreed upon, whether the line which you have agreed upon at that particular place is to go along the line of Smith's quay, and through White Hill Point, in the manner proposed by Mr. Brooks in 1849?—I can give you no answer to the question, because I do not recollect. My memory does not serve me to show any of the lines of the plan in question.

(*Mr. Brooks.*) The lines are all above White Hill Point; no lines are laid down yet upon this plan below.

3670. (*Mr. Webster, to Mr. Cowen.*) Then your attention has never yet been called to any lines in Shields harbour?—I think not; if it had, I am quite sure that two of our committee, that is, Mr. Poppelwell and Mr. Straker, who are of the opposition, would have had the most of their own way in carrying out those lines. I have always felt it my duty to conciliate them.

3671. You seem to have had a desire to be very conciliatory to those gentlemen; you seem to think that one of the great objects looming in the future, will be to have docks above Tyne bridge?—One of them.

3672. Excepting the laying down of these moorings in Shields harbour, which is provided for out of the Mooring Fund, a distinct tax, have the Commissioners ever done any works in Shields harbour at all?—I do not know I am sure what the Commissioners have done; the accounts show, I dare say. I do not recollect what they have done. I only take the accounts as they are laid before me.

3673. You have spoken of the works that the Corporation had included in the Bill which they introduced in 1850, which is now the Conservancy Bill. What works were those and according to what plan?—They were according to the plan of Mr. Brooks; it was before Parliament; it appeared in the committee room. I think you were one of the parties.

3674. I believe the line then laid down, so far as regards works, for instance, from White Hill Point, would have cut off White Hill Point and gone in front of Smith's new quay; that was Mr. Brooks' plan then, I think?—I really do not recollect.

3675. However they were Mr. Brooks' plans?—The plan there was the plan before Parliament. I do not say that we were wedded to these lines, as it were, but that the application for that Act did show certain improvements which the Commissioners were to go on with.

3676. Some questions were asked yesterday by Mr. Brunel, as to the provision made for preventing nuisances. What is the nature of the power of the Commissioners in that respect?—Its nature is explained in the Act of Parliament. We have powers, and if I recollect the clause rightly, nothing is to be deposited within three feet of the edge of any quay. The Commissioners have taken, so far as they can, and if you ask the owners they will tell you the same, very great pains to prevent the putting of anything into the river, and when anyone has been detected, he has been brought before the magistrates.

3677. Do you mean to say that the Commissioners have taken great pains to effect that result, that nothing should be laid within three feet of the edge of any quay?—Most distinctly I do.

3678. Can you tell me one instance in which they have done it?—In many cases.

3679. Then you can tell me one?—In my own case.

3680. You were proceeded against, were you?—No; but I have taken care that my own men should not do it.

3681. I ask you whether you have known any instance in which the Commissioners have put in force that provision against a person on the Tyne?—I do not know a case where a person has been found to have done so, so as to raise a necessity for it.

3682. A question has been asked about these full-tide quay walls. I think there are a great number of places in which there is nothing more than a chalk wall opposite the encroachments?—I do not understand what you mean by encroachments.

3683. Opposite the restrictions in the foreshore, are there not in considerable portions of the river places where you have not full-tide stone walls, or stone quays, but where you have chalk walls as guiding walls?—Yes; half-tide walls.

3684. And there has been a considerable deposit of ballast or of other materials behind such chalk walls?—I do not know that there has been a considerable deposit.

3685. You seem to have taken this letter of the 3d of June as rather a personal matter; will you point out any single paragraph in it which ought to be regarded as a personal matter to yourself?—I did not say that it was.

3686. You said that the letter in reply you had written rather under the influence of feeling?—I said that any warmth of my own expression might be excused in consequence of that.

3687. You are a very constant attendant at the meetings of the Commissioners; I will ask you whether there is a single thing contained in that letter which has not been made the subject of protest or of remark by some one of the Commissioners who signed it?—That is a question which I can only answer in general terms. If I sit there as Chairman or as a Commissioner, I do not really charge my memory with what has taken place either at one time or at another. It is very likely there may not be anything which they have not complained of, but then complaining of it by no means makes it right.

Re-examined by Mr. Seymour.

3688. You have been asked a good many questions with regard to these river lines. I will call your attention to a meeting of the River Lines Committee, on the 19th of August 1854; were you present on that day in the chair?—If my name appears there, there is no doubt I was.

3689. I find also the names of Joseph Straker and Matthew Poppelwell, two witnesess who have been examined by the opposite party here. Were the following minutes agreed to at that meeting? "No. 2. It is not deemed expedient to attempt anything at the "Narrows till the effect of the piers shall be ascertained. 4. The lower part of the "Insand to be dredged, and the sand taken out to sea. 6. White Hill Point must "remain for consideration till the docks at Jarrow Slake and the Hay Hole are com-"pleted. 7. The river line of the Jarrow Docks has been settled by the Legislature; "the remainder of Jarrow Slake to remain as it is till the effect of the dock works shall "be ascertained. 8. The foreshore, from the west end of the Northumberland Docks to "the east end of Willington Quay, to remain open for the present; the line is agreed on "as laid down in the plan, which shall be carried out in such manner as the Commissioners "shall agree. 9. The blue dotted line laid down abreast of Jarrow Quay and Jarrow "Bight, is recommended to the adoption of the the proprietors of the land. 10. The "half-tide wall from the west end of Jarrow Quay to the east of Hebburn Quay be com-"pleted on the line laid down on the plan, and on the completion of the wall the two "cross jetties in Jarrow Bight shall be withdrawn altogether. 11. The river wall in "front of Hebburn Quay to be completed on the line laid down, and the cross jetties to "remain." Were those resolutions unanimously adopted at that meeting, at which Mr. Poppelwell and Mr. Straker were present?—I recollect them.

(*Mr. Webster.*) Will you read the 5th?

(*Mr. Seymour.*) "5. The tail of the Durtwick Sand to be dredged."

3690. (*Mr. Webster.*) Has that been done?—No part of it has been done.

(*Mr. Seymour.*) This was on the 19th August 1854.

(*Chairman.*) They were prospective works, I apprehend?

(*Mr. Seymour.*) They were, Sir.

3691. (*To the Witness.*) I will call your attention to another meeting on the 24th August 1854, at which Mr. Straker and Mr. Poppelwell were also present.—"No. 14. "The Committee approve of the lines on both shores westward to Newcastle Bridge. "17. That the south of the King's Meadows be made the channel for the river; the "width to be regulated according to the breadth above and below." I ask you were those resolutions also carried unanimously, as they appear by this record?—I was not there, and I quite disapproved of those resolutions; it is a part of the river that I am most conversant with, and that meeting was held when I was not there, and it was understood that I ought to have been there, and it has not been attempted to be carried out; that is a part of it still remaining open.

3692. However the other resolutions were carried unanimously?—Yes; there was no difference of opinion.

3693. Are those lines referred to there, which were adopted at that meeting by Mr. Poppelwell and Mr. Straker, lines upon the plan referred to which have been acted upon?—I have not examined that plan.

3694. When reference is made, in resolutions of that kind, to the plan, do you understand it to be the plan usually produced before the Commissioners?—Yes.

3695. (*Mr. Webster.*) There is one question upon that, Sir. Have the resolutions of either of those committees, as regards the river lines, been brought before the Commissioners?—No; we have suspended them in consequence of the business which is necessarily going on before us. We have thought it desirable to do so; there has not been time to get them done. It was understood that we were to prepare a short report and bring it with the plan and the lines upon it before the Commissioners.

3696. (*Mr. Armstrong.*) Supposing these resolutions of the Lines' Committee had to be acted upon, would it be a necessary step first to take them before the body of the Commissioners?—Most decidedly.

3697. (*Chairman.*) I asked some of the gentlemen belonging to the minority these questions, and certainly did not get answers; that I did not extremely regret; but at the

J. Cowen, Esq.

30th January 1855.

same time I should like to hear what answers you would give to the same questions. Do you not think that the improvement of the river has been much retarded by the disputes and litigation which have unfortunately taken place between Newcastle and Shields?—No; I do not think it has been much retarded. I think it has been retarded to a certain extent, but not much.

3698. Do you think it very desirable that these disputes should now cease?—I do.

3699. Is it not very possible, that by forgetting past disagreements, a general plan might be arranged and steadily pursued by the Conservancy for the improvement of the river?—I quite agree with that.

3700. Are you aware, that the Commission in its report can merely suggest changes which must afterwards be carried through Parliament, and probably give rise to much expense and opposition?—I am fully aware of it, and that is the reason why I stated, that in the event of any such bill going to Parliament, especially if it had reference to a change of the constitution, we should have applications from all the landed proprietors for a change of the constitution of the board.

3701. I would therefore only ask you, in conclusion, whether you do not think it much better that you should agree amongst yourselves, to prevent all further disputes?—I would just say, that the greatest benefit which can be conferred on the Tyne, is to leave the Commissioners alone. If not interfered with, the Commission will work well, and accomplish all that anyone could fairly expect from it.

3702. With respect to the committees, how many committees have you in the Tyne Improvement Commission Board?—I cannot tell, they are very numerous.

3703. You have committees for particular purposes?—There are the River Lines Committee, the Finance Committee, the Police and Ballast Committee, the Moorings Committee, the Piers Committee, the Howdon Dock Property Committee, the Northumberland Dock Committee, which is rather an important one, and the Dredger Committee. We have some property at Howdon Dock.

3704. (*Mr. Armstrong.*) That is a division of labour?—Yes.

3705. And those committees are appointed at the beginning of the year for the year?—Yes.

3706. (*Chairman.*) Do they keep complete records of all their proceedings?—Distinctly; Mr. Clayton does not attend them generally. The accountant goes with us and takes down all the resolutions agreed to.

3707. Which are signed by the chairman?—Yes; they are copied into a book, and that book is brought before the next Commissioners' meeting.

3708. So that every one of the Commissioners, desirous to know what these committees are doing or have done, has it in his power, by referring to the minute book of their proceedings, to acquaint himself thoroughly with the subject?—He has not only the opportunity, but if he is at a Commissioners' meeting, the first thing we do is to read over all these minutes; therefore he hears them read over.

3709. Are the plans and maps of every sort connected with the Conservancy open and accessible to every member of the Commission?—To every member of the Commission, at any time he wishes to go and get them. If he went to Mr. Brooks' office, and the door was locked, he might not get them.

3710. At your meetings have you any plan which may be unrolled or produced and referred to on all occasions?—Upon anything that we are discussing, which is to be referred to the plan, the plan is brought downstairs and laid upon the table, or opened out. We have no place where we can open out a plan like this.

3711. By the Act of Parliament you are obliged to have a plan: is it on account of the expense that you have not complied with that clause in the Act of Parliament?—It is so; and if you look to that Act of Parliament (I have not lost sight of the clause), it says "with all convenient speed," or uses some such terms; that does not bind us down exactly to the time, and seeing that we have unfortunately not agreed upon what are really to be the river lines from one end to the other, the main motive of giving that has been that we should bring before the public a complete plan; and the docks and the piers are new works.

3712. You have now in your possession complete materials for a plan of that sort without incurring any expense whatever, because, between Mr. Comrie's and Mr. Calver's, I should think it would be impossible, if you spent ever so much money, to get better ones?—We could not do so, and the only link that I know of, which we want now, is the Admiralty line of the Jarrow Dock. I would remark, with respect to Mr. Comrie, and about his instructions, that I was present on two or three occasions when he was with Mr. Clayton, and I was exceedingly desirous, and so was Mr. Clayton, that the plan which he was to make, and the soundings which he took, should be put on to the plan in red ink, to represent exactly the state of the river as it is now, so that you may see it as compared with the other.

3713. You mean distinguished from Mr. Rennie's?—Compared with Mr. Rennie's and Mr. Rendel's. Mr. Rendel's of 1849 is what we had then to do with, and I think it is only justice to Mr. Brooks to say, that Mr. Brooks was not present when we gave those instructions. I would beg to put in an authentic document upon the export trade last year, showing about 35 per cent. increase; and another table, showing that we at Newcastle pay a greater amount of duty than at Hull, though they are a first-class port and we a second.

3714. (*Mr. Webster.*) You do not happen to have a document showing the amount of tonnage which stops at Shields?—No.

3715. (*Captain Fitzroy.*) Do you admit or deny that there is, generally speaking, a majority in the Commission in favour of Newcastle interests?—I deny it; there is no such limited view taken by the Commissioners generally. You will find, by examining our minutes, or those that have been read to you to-day, that on one occasion one of the Newcastle people voted with Shields.

3716. What, in your opinion, gives rise to the general impression, so prevalent unfortunately, that there is a majority and that there is a minority, what one may call a standing minority?—Localities and interests get divided, and I am sure I shall be excused the expression, but there is somehow or other, and only in the Borough of Tynemouth, a very great hatred to the Corporation of Newcastle.

3717. An opposition of interests, probably, you would say?—I do not know that there is, because I maintain that the interests of both parties are identical.

3718. Personally the gentlemen, no doubt, are very good friends, but there are interests which are opposed, and the opposition of those interests has given rise to the current expression which one hears everywhere, that there is a majority in the Commission, and a minority. While there is a preponderance on one side (I will not say whether due or undue), the proper organization of committees, and the arrangements for distributing the work which is to be done among several people, may or may not be carried out satisfactorily; but supposing that a particular interest be committed to three individuals of a committee, and that those individuals are on one side, they may settle the matter very much as they please, and if there be not a tolerably fair balance in the ultimate appeal of the Commission itself, there can be no remedy for their decision?—Yes; anything that the committee does comes before the general Board, and the general Board will take their view of the matter irrespective of what the committee does. There are some cases where the committees have powers to do certain things, but those are to a limited extent. All these matters are brought before the Board and read, and then the Board may or may not confirm what these committees have done.

3719. I speak as having served on committees myself, where the board appointing those committees was numerous, and where the chairman and a few of the more influential persons had a great preponderating influence. I know from my own practical experience, that the committees there were chosen by a preponderating influence, and that there was no appeal on the part of others interested if they gave an opinion in which the majority agreed, but which might be quite unfavourable to the minority; that minority had no chance?—That would not apply to us; we have no division of opinion as to the appointment of committees that I know of; and we have always endeavoured, as much as possible, to place parties upon the committees who best understand the work. For instance, with respect to the piers, which is a very important question, there are two Commissioners for North Shields and three for South Shields; there have always been two of the members of North Shields upon that committee, and there have always been two of the South Shields members upon that committee, but now there are three of the members of South Shields. That is purely under the impression that these gentlemen, being located at the mouth of the river, would, in all fairness, understand the thing better, I should even say, than the parties further up the river could do, and that, at any rate, would give a preponderating influence if it were necessary.

3720. Then there has been every possible arrangement made for giving those committees fair play, and for enabling them thoroughly to represent the interests in which they are most concerned?—In every respect there has. As I am reminded, I do not recollect that we ever had a division or a dispute upon the committees. We meet occasionally at South Shields and occasionally at North Shields, to go and look at the piers, and at what has been done; we have a piers meeting usually once a month, and we have been thinking lately that we should have it once a fortnight, not compelling all the members to attend, but those members upon the spot could attend whose local interests were most closely identified with it.

3721. With regard to a considerable portion of the practical difficulty which it is asserted has existed in obtaining information as to plans and maps, may not the difference of opinion upon that subject between yourself and other gentlemen be a consequence of the natural facility which the head of a body has in obtaining documents and information as he may wish, which is altogether different from the facility which any other individual may possess? may not something in the practical working be a consequence of the difference between the position of the two gentlemen?—I do not know that that is the case, because there is not an instance where any person wants to have anything which he cannot get and does not get. If I can be the means of facilitating it, I make it a special point to do so. Now that brings me to Captain Purdo's matter about the tidal observations. I found that we could not get the information at the Trinity House; we had no control over the Trinity House, but I immediately said, "Captain Purdo must and shall "have all that we have the means of giving him." I saw the harbour-master of Shields, and I said, "Now what is there that we can do to comply with the Captain's wish?" Knowing that he had a tidal register, he said, "I will supply you, and take care that you "have a copy of the same document every month sent to the Board." I said, "Very "well; if you take care that it comes into my hands, I will take care that it is handed

J. Cowen, Esq.
30th January 1855.

"over to Captain Purdo." I did so, and here is a copy for last month, which I am sure I handed to the Captain, and he handed it back to me. It was not information that he wanted, and therefore it was of no use to him. I will put it in, because it is all that we could get. The Witness delivered in the same, which is as follows:

REGISTER of TIDES observed at HARBOUR-MASTER'S OFFICE, NORTH SHIELDS, in the Month of December 1854.

Day.		High Water. Time.	High Water. Height.	Barometer at High Water.	Low Water. Time.	Low Water. Height.	Barometer at Low Water.	Range of Tide.	Moon's Age.	Wind. Direction.	Wind. Force.	Turn of Stream. Flood.	Turn of Stream. Ebb.
		H. M.	F. I.		H. M.	F. I.		F. I.				H. M.	H. M.
1	A.M.	..	..	..	6 55	3 3	29·32	..	11	N.W.	4	7 55	—
	P.M.	1 20	14 10	29·50	..	..	..	12 7	..	N.W.	4	..	1 40
2	A.M.	..	..	..	8 20	2 10	29·35	..	12	W.N.W.	5	9 20	—
	P.M.	2 0	13 6	29·35	..	..	..	10 8	..	W.N.W.	5	..	2 20
3	A.M.	..	..	..	..	..	..	..	13	W.N.W.	6	—	—
	P.M.	..	..	..	..	..	..	..	..	W.	8	—	—
4	A.M.	..	..	..	9 25	4 6	29·80	..	14	W.	5	10 25	—
	P.M.	3 10	15 3	29·85	..	..	..	10 9	..	W. by N.	4	..	3 30
5	A.M.	..	..	..	9 50	2 0	29·75	..	15	W.N.W.	8	10 50	—
	P.M.	3 55	13 11	29·63	..	..	..	11 11	..	W.N.W.	4	..	4 15
6	A.M.	..	..	..	10 47	4 0	29·32	..	16	N.W.	4	11 50	—
	P.M.	4 35	14 3	29·32	..	..	..	10 3	..	N.W.	3	..	4 55
7	A.M.	..	..	..	11 15	2 7	30·08	..	17	N.N.W.	5	12 15	—
	P.M.	5 30	12 3	30·08	..	..	..	9 8	..	N.N.W.	5	..	6 0
8	A.M.	..	..	..	11 30	4 7	29·63	..	18	W.N.W.	5	12 30	—
	P.M.	6 0	14 3	29·63	..	..	..	9 8	..	N.W.	4	..	6 35
9	A.M.	6 10	14 3	29·46	..	..	..	9 0	19	N.W.	4	..	6 45
	P.M.	..	..	..	12 30	5 3	29·44	..	..	N.W.	4	1 30	—
10	A.M.	..	..	..	..	..	..	..	20	N.W.	5	—	—
	P.M.	..	..	..	..	..	..	..	..	N.W.	4	—	—
11	A.M.	7 30	10 4	29·77	..	..	..	5 10	21	S.W.	4	..	8 5
	P.M.	..	..	..	1 45	4 6	29·71	..	..	S.W.	4	2 50	—
12	A.M.	8 55	11 8	29·87	..	..	..	6 0	22	S.W.	4	..	9 40
	P.M.	..	..	..	2 25	5 8	29·86	..	..	S.W.	4	3 25	—
13	A.M.	9 30	11 3	29·93	..	..	..	7 0	23	S.W.	8	..	10 10
	P.M.	..	..	..	3 30	4 3	29·93	..	..	S.W.	6	4 30	—
14	A.M.	10 15	11 3	29·76	..	..	..	6 9	24	W.	3	..	10 50
	P.M.	..	..	..	5 0	4 6	29·77	..	..	W.	6	6 0	—
15	A.M.	11 45	11 9	29·73	..	..	..	6 6	25	N.W.	4	..	12 15
	P.M.	..	..	..	6 10	5 3	29·72	..	..	N.W.	4	7 10	—
16	A.M.	..	..	..	6 40	3 0	29·71	..	26	W.N.W.	3	7 40	—
	P.M.	12 40	12 4	29·70	..	..	..	9 4	..	W.N.W.	3	..	1 10
17	A.M.	..	..	..	..	..	..	..	27	N.W.	4	—	—
	P.M.	..	..	..	..	..	..	..	..	N.W.	6	—	—
18	A.M.	..	..	..	8 10	3 0	29·26	..	28	N.	5	9 10	—
	P.M.	2 10	14 6	29·26	..	..	..	11 6	..	N.	5	..	2 30
19	A.M.	..	..	..	9 0	2 0	29·49	..	..	N.N.W.	4	10 0	—
	P.M.	2 50	13 8	29·51	..	..	..	11 8	..	N.N.W.	4	..	3 15
20	A.M.	..	..	..	9 50	1 7	29·64	..	1	N.E.	4	10 45	—
	P.M.	3 30	15 2	29·87	..	..	..	13 7	..	N.W.	4	..	3 50
21	A.M.	..	..	..	10 45	0 4	29·82	..	2	N.W.	4	11 45	—
	P.M.	4 40	13 10	29·82	..	..	..	13 6	..	N.W.	4	..	5 10
22	A.M.	..	..	..	11 20	1 6	29·61	..	3	W.N.W.	8	12 20	—
	P.M.	5 20	14 6	29·42	..	..	..	13 0	..	W.N.W.	8	..	5 50
23	A.M.	6 10	15 6	29·63	..	..	..	13 9	4	W.N.W.	3	..	6 35
	P.M.	..	..	..	12 50	1 9	29·65	..	..	W.N.W.	3	1 50	—
24	A.M.	..	..	..	..	..	..	..	5	N.W.	4	—	—
	P.M.	..	..	..	..	..	..	..	..	N.W.	4	—	—
25	A.M.	8 0	11 9	29·62	..	..	..	9 3	6	N.W.	4	..	8 40
	P.M.	..	..	..	1 45	2 6	29·62	..	..	N.W.	4	2 45	—
26	A.M.	8 50	11 6	29·45	..	..	..	7 5	7	N.W.	4	..	9 20
	P.M.	..	..	..	2 25	4 1	29·50	..	..	N.W.	4	3 25	—
27	A.M.	9 40	11 11	29·68	..	..	..	7 11	8	N.W.	4	..	10 25
	P.M.	..	..	..	4 25	4 0	29·70	..	..	N.W.	5	5 10	—
28	A.M.	10 50	10 0	29·30	..	..	..	7 0	9	N.W.	7	..	11 35
	P.M.	..	..	..	5 25	3 0	29·31	..	..	N.W.	8	6 20	—
29	A.M.	..	..	..	6 15	1 0	30·20	..	10	N.W.	8	7 15	—
	P.M.	12 15	11 5	30 20	..	..	..	10 5	..	N.W.	8	..	12 50
30	A.M.	..	..	..	7 15	0 6	30·20	..	11	N.W.	8	8 15	—
	P.M.	1 20	12 3	30·20	..	..	..	11 9	..	N.W.	8	..	1 45
31	A.M.	..	..	..	..	..	.	..	12	N.W.	9	..	..
	P.M.	..	..	..	..	..	.	..	..	N.W.	8	..	..

JOHN NELSON, Observer.
WILLIAM WAKE, Harbour-master.

(*Mr. Cowen.*) If there is anything that a gentleman will bring forward, a motion or anything else by which we can get at it better, there is not the slightest disposition on the part of the Commissioners or anybody else to prevent it; the greatest facility would be given to him.

3722. The delay in furnishing the public with maps, at a shilling each, on a large scale, is partly on account of the expense, and partly on account of the wish to give them correctly when issued?—Yes. I think we shall now very soon be in a condition to do that.

J. Cowen, Esq.
30th January 1855.

3723. Not having hitherto inflicted any penalty under the section of the Act for throwing rubbish into the river, the reason why that penalty has not in any case yet been enforced, is owing to what?—There is no instance where we have met with anybody offending against the Act in which he has not been taken before a magistrate.

3724. No statement has been made to the Commissioners of such a fact having occurred?—Not one within my knowledge where the party has not been so treated, and the Commissioners have stated again and again, that that clause of the Act should be carried out most rigidly. In a long line of river like this, people do things which you cannot get to know. We have the police going about in the river daily, and they have fined many people. It is a mistake to suppose that we have not done so, because we have got hold of every one that we have known to have offended in that way.

3725. As charged with the conservancy of the river, is it not the duty of the Commissioners to have some guard or look out; some means taken for detecting such offences?—We have the policeman regularly going up and down the river; we have the police force with the police boats. I do not know that there is a bill here, but there are printed bills issued threatening what will be the consequence if any person is detected in doing it.

3726. Will you be kind enough to explain to me a little matter, which, although gone by, may have tended to create the impression which has prevailed respecting the opposition of interests. There was a bill brought in some years ago for docks at Tynemouth?—Yes.

3727. Those docks were opposed by the gentlemen at Newcastle for some special reason. Do you remember what the argument against those docks was, because I see that Mr. Brooks has recommended them?—That is at a very early period. I recollect perfectly with respect to the docks which you are speaking of; the majority of the Commissioners considered that they would be injurious to the port, and to the river, and not only the majority of the Commissioners, but the whole of the South Shields people. It was not confined to Newcastle. I believe (I stand corrected if I am wrong) that every one of the Commissioners of South Shields spoke against it. At any rate Mr. Clay I know most distinctly did, upon the principle that it was so near to the mouth of the river, so near to the bar, and most especially pending the formation of piers, that it would have been a most injudicious step to have permitted to be taken.

3728. That was the general impression at that time?—There was no other thing; the idea of preventing the people of North Shields from getting docks, I think is the last thing that ever entered the mind of any Commission. The reason why the Commissioners voted against it and opposed it, was wholly upon the ground that it would injure the river and the harbour, and especially pending the formation of piers.

(*Mr. Seymour, through the Chairman.*) Was it not thrown out before Parliament, upon the evidence of the promoters on that ground?

(*Mr. Webster.*) Indeed it was not, the committee threw it out.

(*Chairman.*) However, that is not important.

C. Allhusen, Esq.

CHRISTIAN ALLHUSEN, Esquire, sworn.

Examined by Mr. Seymour.

3729. I BELIEVE you are one of the Commissioners for Gateshead?—I am.

3730. Are you a merchant carrying on business at Gateshead?—I am a merchant and manufacturer in Gateshead, and I have been a merchant in Newcastle for 25 years.

3731. Have you carried on during that time an extensive trade with Europe and America, and India?—Yes, I have carried on an extensive trade during that time with most parts of Europe, America, and India. I was also a shipowner, and employed my ships in the India trade.

3732. Are you the owner of manufactories situated on the south side of the Tyne?—I became the proprietor of two manufactories on the south side of the Tyne, which have a river frontage of about 1,200 feet. In the year 1840 or 1842, I obtained permission from the Corporation of Newcastle to erect a quay, which I built at a very considerable cost; I think between 4,000*l.* and 5,000*l.* That quay was built with the view of obtaining a deep water frontage for my property, and I believe it has been generally considered a great improvement to the river. During the observations which I have heard here and elsewhere, I have gathered that the Shields people are of opinion that such grants are given by the Corporation of Newcastle with the view of improving their own property. Now I believe what applies to myself applies to most of the parties who have laid out money upon similar principles. It is true that I have improved the property considerably, but the Corporation has not derived any benefit whatever from the improvement, because my leases for the river-side property are granted for 21 years; and at the expiration of that period they are renewable by custom, but after the ultimate termination of the leases, the interest of the Corporation will also cease. Therefore the Corporation could have no other object in granting the permission referred to than to facilitate the trade of the port.

3733. (*Mr. Armstrong.*) Is it Dean and Chapter property?—It belongs to the Bishop of Durham, but it is held by the Corporation under a very long lease.

3734. (*Mr. Seymour.*) I think you observed that the same remark applied to other grants?—Yes. After I had built my quay, several very extensive quays were built on the west side of my property, and the same remarks apply to them.

3735. After you became a member of the Tyne Commission, I think there were one or

C. Allhusen, Esq.

30th January 1855.

two matters to which you principally gave your attention?—Having a very considerable interest in the trade of the Tyne, I naturally felt disposed to do what was in my power to promote its prosperity. When I entered the Commission I found that there were simply Parliamentary powers for collecting certain dues, and for spending them upon the bed of the river, but there were no powers for making permanent improvements; I consequently directed my attention more particularly to the adoption of general river lines, with a view of obtaining Parliamentary powers for their execution. I may state that my efforts have almost entirely been directed to those points, because I saw at an early stage after entering the Commission, that the difference between the Newcastle and Shields Commissioners mainly arose from the difficulty in agreeing upon that point. Subsequently, at a view held on the 23d of May 1853, when most of the parties forming the minority in the Commission were present, I consulted separately with each of them, and succeeded in prevailing upon Mr. Stevenson to go down with me into the cabin of the barge, where we carefully examined Mr. Rendel and Mr. Brooks' plans. My object was to prevail upon him to state what he and his friends wanted; information which it was always most difficult to elicit; however, I ultimately succeeded in doing so. The particulars were then put down upon paper, a copy of which I hold in my hand, and which I should like to put in. The main matters which require improvement in the river are contained in this document. It is to this effect:—"The Commissioners having considered the plan of the Tyne between Hebburn Quay and "Newcastle, are of opinion that the following operations might be advantageously executed "as soon as funds will permit: to carry out as rapidly as possible the resolution of the "Commissioners to carry a half-tide wall along Cockrane Sand on Mr. Brooks' line from "the stone jetty at Hebburn Staith to the upper wooden jetty at Hebburn Quay; to "deepen the under-water shelf of rock at Bill Point to a depth of 7 feet under low water "as far back as Mr. Brooks' line, but keeping in view at a future time a much larger "diminution of the point; to quay in the bight opposite St. Anthony's Point, and to "cut off 60 feet from the projecting corner opposite St. Anthony's Chemical Works; to "cut off the sand at Felling Staiths as far inwards as Mr. Brooks' line; to cut off 66 feet, "if possible, from Friar's Goose Point; to build a quay between Friar's Goose works and "Mr. Allhusen's works." This document was signed by Mr. Stevenson, by myself, Mr. Dodds, Captain Purdo, Mr. Ormston, Mr. Hawks, Mr. Thomas Ridley, Mr. William Armstrong, and by Mr. John Robinson. I naturally conceived, inasmuch as the majority of the Commissioners had signed this document, that at the next meeting of the Commissioners all difference would be at an end, and that we should do some work instead of talking. However, the very parties who signed this document counteracted their own proceedings at such meeting. From that moment I came to the conclusion that they were not sincere in their professions to improve the Tyne at its western end. I therefore saw it was useless to press the proposed improvements for the moment, but at a subsequent period I again agitated the question, and succeeded in passing the resolutions adopted at the meetings held on the 19th and the 24th of August, which have been read. Immediately after those meetings, which were attended by Mr. Straker and Mr. Poppelwell, both stated to me that it was a great pity, as we were all agreed now, that the Royal Commission had been appointed, for there were, in fact, no differences remaining. Still the difficulty of carrying out these proposed and agreed resolutions remained what it was. I then spoke to Mr. Stevenson on one occasion, and his reason for still opposing was, that it was of no use whatever attempting any improvement so long as Mr. Brooks was the engineer. I also spoke to Captain Linskill, who asked me if I did not think it a great deal better that they should first be more strongly represented at the eastern extremity of the river before attempting to carry out great works.

(*Mr. Webster.*) This, as I understand, is some private conversation.

(*Chairman.*) I would say that it raises all the former squabbles when we are all trying to throw oil upon the waves.

(*Mr. Seymour.*) It is my duty to trace the cause of the dissension; it is entirely for the Commissioners; but I would submit that the proper use of this evidence would be that it accounts for what may be called, perhaps, the pertinacious line of conduct on the part of some persons in the Commission, according to my view.

(*Chairman.*) If you think it important, I have not a word to say.

(*Mr. Seymour.*) After that intimation I shall not pursue it further.

(*Mr. Allhusen.*) I merely wish to explain to the Royal Commissioners where the real difficulty is. The Shields Commissioners do not wish to do anything until either they have a majority in the Commission, or until they shall have got rid of Mr. Brooks.

3736. (*Mr. Seymour.*) Have you strived hard to bring the various members of the Commission into a more harmonious state?—I have done everything I could to make them harmonious, and I have on several occasions agreed with the Shields Commissioners on important points.

3737. In your opinion is it possible to improve the depth of water at Newcastle without at the same time improving the harbour of Shields and the depth on the bar?—I should say if the depth at Newcastle be improved the depth at the bar must naturally be improved, because the greater the amount of water obtained at the western extremity of the river the greater must be the velocity in discharging it; and inasmuch as the scouring power is increased by superior velocity, I attach great importance to the attraction of the tidal flow to the western portion of the river, a result which would follow the adoption of the proposed improvements.

3738. As a general question of trade and commerce, do you consider that the interests of Newcastle and Shields are opposed to each other, or are they identified?—They are identified. I may state that the only warehouses in North Shields were in my occupation during a continuous period of years.

3739. I believe you produce a list; what is it?—It is Mr. Brown's export list, which shows where the trade is carried on in the Tyne. It is published by one of the Custom House authorities.

(*Chairman.*) That can hardly be called an authenticated document.

(*Mr. Seymour.*) If my learned friend admits it, probably there is no objection to it.

(*Mr. Webster.*) It comes from the chief clerk of the Custom House.

(*Chairman.*) I think we had better not receive it.

Cross-examined by Mr. Webster.

3740. You as a merchant will know this, that there is a large difference between the disposition of the cargoes coming into the Tyne, and the disposition of the ships ascertained by tonnage?—I do not comprehend you. I have also an account here, which is a copy of a Parliamentary Return, showing the difference between the ports in 1830 and 1852, separating Shields from Newcastle, which at one glance shows the comparative importance of the two ports.

(*Chairman.*) We know, without going minutely into it, that the trade to Shields and the trade to Newcastle are both extremely important. As far as this Commission is concerned, we consider their interests identical. Therefore, to go into points to make out one a little better or worse than the other, seems to me quite unnecessary.

3741. (*Mr. Webster.*) The paper which you have produced is a return prepared by the clerk of the Custom House, I think?—It is prepared by Mr. Brown.

3742. Who is the clerk of the Custom House?—I think so.

3743. It is not an authentic document, except in that respect?—It is authentic only in that respect.

3744. You have also alluded to another paper which refers to Custom House returns?—It relates to the number of ships which entered the Tyne in the years 1830 and 1852.

3745. Have you any return showing, out of the total tonnage of the Tyne, how much stops within the boroughs of Tynemouth and South Shields, and how much comes up to Newcastle?—No, I have not.

3746. Do you not know, as a fact, that nearly nine-tenths of the whole tonnage which comes into the Tyne stops within the borough of Tynemouth, or within a line drawn across there, and that only about one-tenth comes up to Newcastle, or above that?—I think, so far as vessels in ballast are concerned, and which load at Shields, you are right.

3747. Is not this the course of business, that, owing to the old business establishments and the old Custom House at Newcastle, up to the present moment a very large number of ships are cleared at Newcastle?—Because the trade is carried on at Newcastle by the Newcastle merchant, it is quite evident that most of the Custom House business must be done there.

3748. You having been acquainted with Shields, and having had warehouses there, will probably know the fact, that up to the present moment there is not a single quay in the port of Shields, excepting a small private low-water quay belonging to his Grace the Duke of Northumberland?—I believe there are but two warehouses in North Shields, and they belong to the Duke.

3749. Are you aware of the Shields party having frequently attempted to get quays, and having been invariably opposed by the Corporation of Newcastle?—I am not aware that the Corporation of Newcastle has opposed them. I know they have attempted to get quays.

3750. They have not succeeded?—No; they appear to have failed for want of means.

3751. I believe you are very much in favour of the transference of the four-fifths of the coal dues to the river purposes; you think it ought to belong to the river?—I have always expressed the opinion, that it would be best to abolish the present dues, there being 26 in number, and that one river due should be substituted for river purposes.

3752. Are there as many as 26 at present?—There are 26 different dues.

3753. You have referred to a paper containing various matters which were agreed upon on the 23d of May 1853 between you; are not those matters which all those gentlemen have invariably been anxious to see carried out?—They have sometimes expressed themselves so, but when it came to the point they never wished anything done until Mr. Brooks was discharged, or they had a majority; those were the two points they had in view.

3754. There has been a difference of opinion as to the mode of carrying them out, I believe?—There has been; they were determined that they would have their own way in carrying them out, and upon no other principle would they proceed with them.

3755. Was not the real ground of objection this, so far as Mr. Brooks was concerned, that they were well aware that he was so pledged to high-tide jetties, that they would never get any work done but in that way?—No; Mr. Brooks ceded his opinion with regard to high-tide jetties; at any rate, that matter and everything else was agreed upon between all parties.

3756. Do not you know that Mr. Brooks even made high-tide jetties when the Commissioners had ordered him to make half-tide jetties?—That must have been before I was a Commissioner.

C. Allhusen, Esq.

30th January 1855.

3757. You do not know that?—No.

3758. Did you hear Mr. Brooks state yesterday, that his object had always been to make solid land and high-tide quays?—I was not in the room.

3759. I believe you on the 29th of September had on a preceding occasion given notice of a motion to this effect, "That Parliamentary powers be applied for with a view to "obtain authority to apply the proceeds of land to be taken from the river for the benefit "of the funds of the Tyne Improvement Commission." You had given notice of that motion, I think?—The motion was given, but it was not given by myself; it was a mistake. I gave notice of a different motion.

3760. Was not that motion which I have now read given with your assent at some time or other?—I have already explained, that I conceived the powers which we possessed for improving the river were not sufficient; we had not the power to take a single inch of ground from any landed proprietor; we also incurred very serious responsibilities, in my opinion, in making half-tide walls, or any other walls without the consent in writing of the proprietors. In order to put an end to the doubts which I had upon those points, I was desirous that Parliamentary powers should be obtained, which would permit parties to build quays with the consent of the Commissioners, a principle which would secure a revenue, and so assist in carrying out improvements. My notice of motion was given with that object.

3761. Then you do think it expedient, that Parliamentary power should be obtained for carrying out river works according to some settled plan to be defined in the Act?—Decidedly so.

3762. Do you agree in the opinion contained in that report of Mr. Rendel's, and also given in evidence, that Conservancy powers can never be effectually carried out without compulsory power?—Entirely; if we require other people's land, we must have compulsory power to take it.

J. Mather, Esq.

James Mather, Esquire, sworn.

Examined by Mr. Seymour.

3763. I believe you are a Commissioner for South Shields?—I am.

3764. What length of experience can you speak to as to the condition of the Tyne?—I remember the Tyne upwards of 30 years.

3765. What was its condition at the furthest date that you remember, the condition of the Tyne?—Previously to the establishment of railways between Newcastle and Shields, I had frequent occasion to be at Newcastle, and the best means of conveyance were the steam-packets upon the river. Unfortunately for me, at that time I had frequent occasion to visit Newcastle, and very often I was left upon the shoals of the Tyne; first at Jarrow, then again, up at St. Peter's, for two hours, sometimes for three hours together, waiting for the tide.

3766. (*Chairman.*) How long ago was that?—That would be somewhere about the year 1830 or 1831, or 1832.

3767. About the year 1845, comparing the condition of the river with its present condition, was it then worse than it now is?—I can speak more distinctly with reference to the present time and the time which I have previously spoken of. It was then much worse than now.

3768. Looking to the present condition of the Tyne, what is your opinion as to the result of the works and the operations which have been carried on upon it?—I think the river itself is, in the points which I have just alluded to of the great obstructions, very much improved. The depth of water at that time could not have been more, over these shoals, than about three feet or so. Small packets were used; now we have large steam packets for towing, perpetually passing up and down the river at all times of tide, and I never see, nor have I heard of such occurrences as I have just named.

3769. In your opinion has the Commission worked efficiently?—Presuming that the Commission have made the river arrangements, which have produced such effects as I have stated, I cannot do otherwise than say that the Commission must have worked efficiently; but I beg to state other grounds also upon which I think it has worked efficiently. I find that the tonnage of this port has increased in size to a very large extent. I do not mean the mere amount of tonnage, but the size of each particular vessel and the average of the whole. I do think, notwithstanding some engineering opinions, and the numerous and perplexing opinions which are given by pseudo and amateur engineers, that this practical development of the Tyne is demonstrated by the daily expressed opinions of shipping men from all parts of the world, and of shipowners along the whole coast from one end of it to the other. As one of the best possible proofs of the condition of the Tyne, if you will permit me, I will put in some statistics condensed and digested from the Parliamentary records of what the Tyne was in 1844, in reference to this point, and what it now is. The Parliamentary documents are here.

3770. What are they?—The shipping returns. I have put together these figures, and they show this result. I will take the adjoining ports on the Tees, the Wear, and the Tyne. I find that the Tees, in 1844, had 10,707 ships, with 1,327,031 tons; the average size of the vessels of the Tees was then 124·1 tons. I take the Tees in 1854, just ten years afterwards; I find the ships then of the Tees were 4,180, and the tons 404,960, showing a decrease in the Tees of 6,527 ships, and in tonnage of 922,071. There is another cause, which will be named, and which may explain, perhaps, this great decrease, but it will not

explain the decrease of the average size of the tonnage. The average size of the tonnage of vessels of the Tees has fallen from 124·1 to 96·8, showing that either the Tees has decreased in its engineering or its river capabilities, or that there is some other very powerful cause affecting it. Hartlepool is a port constructed upon the sea at the mouth of the Tees in Tees Bay; it was not in existence for shipping in the year 1844; it has since been created. The ships in 1854 were 10,319, with a tonnage inwards and outwards of 1,409,947; the average size of the vessels of Hartlepool is 136·6. This may have affected the Tees. I may also say that there is a regulation in the other ports, that no vessel under a certain size, which my memory does not supply me with, shall enter the Tees mouth for cargoes, without the forfeiture of her insurance under policies; it shows the practical opinion of the condition of that river. We then go to the Wear, to Sunderland, our adjoining port. There were 7,932 vessels in 1844, with 1,081,788 tons; the average size of vessels there was 136·3 tons. The Wear, in 1854, had 17,057 vessels, with 2,128,267 tons, an increase of 9,125 vessels and 1,046,579 tons. The vessels of the river Wear, instead of increasing in size, are now only 124·7, being a difference of about 8·5 per cent. I may state also in explanation, that the absolute necessity of vessels being of the largest possible size I believe is acknowledged universally by shipowners. I believe that between the sailing of a vessel of 500 tons and one of 250 or 200 tons, the difference is nearly 30 per cent. in cheapness on the larger; therefore there is a disposition everywhere to increase the size of the vessel, which has certainly been the disposition along the east coast, and it is only restricted by the capabilities of the river. The Tyne had ten years ago 22,585 ships, with 2,882,666 tons, and in 1854 it had 26,510 ships, with 3,659,648 tons; the increase has been 3,925 vessels with 776,982 tons; the average size of the vessels in 1844 was 127·6, in 1854, 137·8, giving an increase in the size of the vessels of the Tyne of more than 8 per cent.; they are the largest of any vessels coming to any part of the east coast. When there are so many smaller vessels from all the neighbouring ports trading to the Tyne, the immense size of the larger tonnage of from 400 to 500 tons, that must make up that average to 137, may be well supposed. The sailing ships of the Thames in 1844 were 40,202, their tonnage was 5,245,623. In 1854, the number of the sailing ships of the Thames was 44,308, with a tonnage of 7,021,276. Then there are the steamers, which are an important feature in the Thames, but which are no feature here; if there is a passage at all possible to be accomplished, steamers are capable of accomplishing it, giving them an increased number of voyages. The number of steamers in the Thames in 1844 was 3,975, with 1,436,622 tons, and in 1854, 5,362 steamers, with 1,639,333 tons. There has been an increase on the total amount of steam and sailing vessels of 5,993 vessels, with 1,978,364 tons. The average size of the sailing vessels of the Thames is 158·4; that of the the sailing vessels of the Tyne is 134·8; making a difference of only 23 in the average sailing vessels between the Tyne and the Thames. These are the particular facts which I have taken leave, I am afraid tediously, to name to the Commissioners, because this is what I may call the concentrated opinion of practical men in reference to the navigable capacity of the Tyne. I know of no other cause.

3771. In your opinion, upon the whole, looking to the increase of the tonnage going up the river, and to the other facts which you have mentioned, do you think that the operations of the Commission, as far as they have worked, have worked well?—I think, considering the obstructions, sand banks and others, in the Tyne, that they have worked exceedingly well. In addition, I cannot but say (though I am a young member of that Commission, and I therefore can do it, I trust, with more propriety), when I find that that part of the river which I know so very well has received so much of their attention, where nearly a million of money has been concentrated to improve the lower portions of the river and facilitate the navigation, looking at the piers, the docks upon the slake, and the Northumberland Docks, which are supported or promoted by the Tyne Commission; when I am not aware that 50,000*l.*, or 5,000*l.* either, has been spent by it in any other portion of the river, I cannot but feel that as far as we are personally interested at South Shields, the Commission has worked exceedingly well. There are two other things which I have not heard named, I think, but which are of great importance here. The removal of Newcastle bridge was before the Commissioners a short time ago, which I believe is admitted in every direction to be an important feature in the engineering of the Tyne. It is admitted also, I believe, by every member of the Commission, that it is desirable to have this bridge removed at the earliest possible time. The Commissioners at the west end of the river, as contradistinguished from the Commissioners at the east, who are largely interested in deep water above Newcastle, and a perfect scouring power downwards to the bar, were exceedingly anxious that this removal should take place. It was the misfortune of the Commission to differ here upon a financial question, not an engineering question. I for one (and I was exceedingly rejoiced to be so) happened to be in the opposition, and instead of Newcastle, or the western localities, being perfectly overpowering and carrying what they sought to accomplish, we the minority (at least if I am to be permitted the honour of being included in the minority) defeated them in that very object, or placed them in so narrow a majority that the question was not presentable before Parliament, because the financial scheme brought before the Commission was not at all satisfactory, and would have encroached too much upon the general fund of the river.

3772. (*Mr. Armstrong.*) You would have done it if you could have afforded it?—Yes.

3773. But you thought, that not having the means at hand it was not wise to commence it?—Yes; but I believe arrangements will be made, I trust by next session, to accomplish that most important object on the Tyne. I do not know whether I may be permitted to hand in, in speaking of the piers, some statistics in reference to them, as the whole question

J. Mather, Esq.

30th January 1855.

has been opened here, and it is a very important question. I know that since I have gone into the Commission, we have done nothing but labour at the piers without producing any results; it is not the fault of the Commission, I venture to say, but of parties over whom we have no control, and who have no control over us. This has been the chief cause why, for the last twelve months, these piers have not made progress; and when I contemplate that it is not the mere work of navigation, it is not the mere work of a deep entrance over a bar, but the question of thousands of men's lives which are at stake, I am really myself astonished at the obstructions which we encounter in our progress. All our plans are ready, everything has been done that we can do, and we are now stopped by an external observations, which I am sorry to say up to this moment we have not removed. Your Commission here will favour, I trust, the proper object of the Commissioners of the Tyne, and facilitate the removal of such obstructions as may lie in the way of that important work. The document which I wished to submit was the average number of wrecks.

3774. Did you not name that in your application to the Chancellor of the Exchequer and to the First Lord of the Admiralty?—We did. But this is a more extended account; it not only applies to the short radius of 30 miles from the Tyne, but it goes to a much greater extent, and this is a question which, as soon as these piers are completed, will touch every portion of the north-east coast, about which, I think, one of the members of the Royal Commission made an examination. It extends for 100 miles from the Tyne.

3775. You gave the calculations with reference to this particular locality, and you say that this will become a harbour of refuge for the whole sea coast; and therefore you propose now to give the number of wrecks all along the coast?—Yes, 100 miles in extent.

(*Mr. Armstrong.*) I do not know that it is very material to go into that matter, with reference to the objects of this Commission; it might be very important with reference to another deputation where you went before.

3776. (*Mr. Seymour.*) Would you recommend any change in the present Commission, or would you allow it to continue, in the hope of greater harmony in future?—I would allow it to continue. I would also venture to express an opinion on this point, that a minority must always continue to be a minority if it chooses to be so, and notwithstanding that the works of the Tyne must be continued according to the judgment and upon the responsibility of the majority. All bodies are guided by their majorities, and I should object to the interference of any external party, such as the Admiralty, for whom I have the greatest possible respect for its warlike energies, but in a matter of this kind it is a very different thing. I should certainly object to spend my money and the money of my constituents, merely for warlike purposes, upon the Tyne, in the lower part of the river, and not for general commercial purposes. If I may be allowed a suggestion here, I should think it very advantageous, and that it might be done with propriety, that there should be some scientific Board in London to whom all vexed questions might be referred, which would have saved yourselves, at this season of the year, a troublesome, and from what you have seen, I am afraid, a very unproductive journey. Some scientific Board of that kind for reference by the important rivers of this kingdom, or on of matters of disputed engineering, I trust may be hereafter adopted, whose decisions could not but be deserving of the highest respect.

Cross-examined by Mr. Webster.

3777. Then you think it very expedient that there should be some general Board to take in hand all these vexed questions which arise about rivers?—Not to take in hand; to be referred to for their opinion.

3778. As a Board of Appeal?—Not appeal for decision, but for advice.

3779. You spoke about your constituents; whom do you regard as your constituents?—The town of South Shields, and its district.

3780. I think you are rather in the habit of haranguing them there, are you not?—No; not in the habit.

3781. Your business is that of a wine and spirit merchant, is it not?—And formerly a shipowner also.

3782. It is a mixed question, is it?—Not at present; it was formerly.

3783. You have not been a Commissioner very long, I think?—I am the youngest, I believe; I have been born only three months.

3784. I suppose you would like to have the other nine out at all events?—I care little about it; the pleasures of the life, as you see, are very few.

3785. With whom is it that the obstruction as to the piers now rests?—If I may be permitted, I would decline to give an answer to that.

(*Chairman.*) Give an answer.

3786. (*Mr. Webster.*) With whom do you think the obstruction rests?—I think it is with the Admiralty.

3787. You have not always been of that opinion, have you, about the Admiralty?—On this subject of the piers I have.

3788. Do you remember making a very eloquent speech at a South Shields meeting, on the 9th of January 1850; "James Mather, of South Shields"?—I do not remember having done so.

3789. Do you remember giving utterance to this opinion? "The Corporation" (I presume that was Newcastle) "wanted to keep the Admiralty wholly out of the Commission, "but he thought it would not be the least important part of the Tyne Conservancy Bill "that it gave five Commissioners to the Admiralty."—What was the proposed constitution of that Commission?

3790. I will read it again: "The Corporation wanted to keep the Admiralty wholly out "of the Commission, but he thought it would not be the least important part of the Tyne "Conservancy Bill that it gave five Commissioners to the Admiralty"?—Well, we have got two Admiralty Commissioners; we are to have two.

3791. Two of the Admiralty?—I understand so; they are to be appointed by the Admiralty.

3792. (*Mr. Armstrong.*) In the event of vacancies?—Yes.

3793. (*Mr. Webster.*) Did you make speeches in favour of the Tyne Conservancy Bill as promoted by the Shields party in 1850?—They scarcely deserve the name. I expressed my own opinion at a public meeting, that the constitution of the Conservancy of the Tyne should be changed.

3794. You have spoken of the increase in the size of the vessels; do not you remember in the various harangues which you have made, that one of the great causes of complaint against the old Conservators was, that inasmuch as the ships had increased in size, they had done nothing to give you accommodation in Shields harbour?—I do not remember such a thing as that; I think it is impossible.

3795. Is it a fact that they have done anything in Shields harbour?—It is a fact that they are doing enormous things in Shields harbour at present.

3796. The piers?—The piers and the docks.

3797. You talked a great deal of what you call pseudo and amateur engineering; have you not had a little touch at pseudo engineering?—I do not know what you mean.

3798. Did you not write a letter some years back, signed "A Civil Engineer"?—I should like to see it.

3799. Do you remember, on the 23d of February 1837, writing a letter from the banks of the Tyne (I suppose when you were left dry), addressed to the Chairman and members of the River Committee?—I remember addressing a letter; I should like to see the letter.

3800. Signed "A Civil Engineer," and written by you; do you remember it?—I should never have remembered it; but I think some of these gentlemen around you once brought my remembrance to it.

3801. Then you now remember writing a letter from the banks of the Tyne, signed "A Civil Engineer," do you?—I believe I did; but I do not know that it is that letter.

3802. Did you ever give expression to opinions of this sort—civil engineering opinions? "These remarks then all resolve themselves into this, full room for the tide in your river for "the supply of water from the sea below, and not from the interior above, for which purpose "deepen every part of its bed, if possible, to high-water mark." Were those your opinions? —Yes; and they are still.

3803. Then you do not abjure pseudo engineering, I hope?—I am still of that opinion; and perhaps that will give me an opportunity of stating in detail that, though I differ from the present engineer of the river with regard to jetties, his half-tide walls I coincide in; and generally, in fact, with our friends, and your friends the minority, as far as engineering is concerned; but the Tyne Commission is the place for me, I presume, to sustain my engineering opinions.

3804. I believe there has been a considerable difference of opinion at South Shields as to the policy of Mr. Brooks' plan of cutting off White Hill Point?—No difference; we decidedly object to Mr. Brooks' plan of cutting off White Hill Point, and I will give one common-sense reason, intelligible, I hope, which is this: If you wish to have the river more direct, should you cut off White Hill Point, instead of making it more direct, you give it a more acute angle at the Hay Hole Point. The angle then would be only about 112 degrees from Hay Hole Point to the two reaches of the river; as it stands now, it is about 135, so that by cutting off White Hill Point you would make the river turn at a more acute angle than it does now at that point. It is objectionable, it is said, because it stands a little prominently from the shore, and that seems to be the only objection; but it gives the river a more obtuse angle, and more direct force.

3805. Do you remember sending out a letter with your name to it, containing this paragraph? "In going to attend the Committee for the Ventilation and Lighting of the "House (upon which I expect to give evidence), I met some northern friends busy with "the Tyne Improvement Bill. I also met Mr. Robinson, who told me the question had "been agitated before this Committee of cutting off White Hill Point. I immediately went "to the Committee. I saw the Town Clerk of Newcastle, Mr. Brooks, the engineer, "Mr. T. J. Taylor, the Duke of Northumberland's agent, and others, and they agreed to "resist the introduction of a permissive power into the Bill, which, if agreed to, and ever "adopted by the River Commissioners, would have placed the upper part of South Shields "in ruin. I offered not only to give my evidence on the subject, but, becoming most "anxious, to-day I got an introduction to one of the Members of the Committee, who "kindly promised, as far as he was concerned, that such a clause should not be introduced, "and he would state the reasons to the Chairman, and let me know in a short time. Not "content with this, I felt the thing so serious that I was determined to take the responsibility, "and oppose the matter by counsel."—I did not send out that letter, but every word of it is true to the letter; and I employed a barrister to oppose it.

Re-examined by Mr. Seymour.

3806. It was not Mr. Webster, I presume?—No; it was Mr. Cayley

J. Robinson, Esq.

30th January 1855.

JOHN ROBINSON, Esquire, sworn.

Examined by Mr. Seymour.

3807. I BELIEVE you are one of the Commissioners for Shields?—Yes.

3808. (*Chairman.*) North or South?—South Shields.

3809. (*Mr. Seymour.*) Are you a shipowner?—Yes.

3810. Owning a considerable number of ships?—No, not a considerable number.

3811. What is the period of your experience? how long have you resided on the banks of the Tyne?—All my life.

3812. Comparing the condition of the river Tyne now with its past condition in your memory, do you consider it improved?—Yes, I certainly do. I consider that the channel is straighter, shorter, and deeper.

3813. Looking to the working of the Commission since you have been a member of it, do you consider it has worked well?—I think it has, generally. I think the working of it is improving daily.

3814. Are there any reasons which you would like to give for coming to the conclusion as to the opinion which you have just expressed with regard to the river, or to the Commission?—I may state that I have generally voted with the minority on the questions which have divided us; they are principally composed of the parties who promoted the Tyne Conservancy. We at that time held very strong opinions as to the mode in which the river should be improved, and we still hold those strong opinions, and have brought forward many motions in the Commission with respect to the plan. We generally approve of the river being improved by means of training half-tide walls. These motions have generally been carried against us, with one or two exceptions. I think that in some instances we, perhaps, have carried the matter almost to a factious length, for I may state that my friend Captain Purdo, after the question was decided, still continued to give notice of motions to the same purpose, a thing that is not reasonable in bodies acting by majority as we do. I saw it was having a bad effect in the Commission, and I was the means of getting him to hold it back for three or four months, by stating that I myself would again bring the subject forward on the first opportunity, and endeavour to get a good meeting, so that we might have it thoroughly discussed and decided. I did so; and we endeavoured to make the best muster we could, and to use every argument possible to convince our opponents that we were in the right. We did not succeed in doing so, but the minority have still continued; at least I myself have not given any more notices, but I have contented myself with supporting resolutions of that sort when they came. I frequently thought at the same time, that we rather obstructed the working of the Commission by too many of these motions, and injured our own cause.

3815. Do you know many cases in which persons have been prosecuted for throwing ballast into the river?—There have been several. The magistrates of the borough of South Shields have had a great number of cases of that sort before them, of persons throwing ballast into the river, and I think there has recently been a case of some person throwing ballast on to the quay, and neglecting to take proper precautions to prevent its going down the foot of the quay. Penalties have been levied of 5*l.* and 10*l.*, and I think in that case it was a penalty of 5*s.* The other cases were some of them wholesale; in fact, it is a subject which has occupied a very great deal of the time of the Commission in devising means to get at what we knew was taking place throughout the river, and at last, in the Police Committee, we ordered a policeman to get one of the ordinary skuller boats, and to go disguised as a seaman travelling about the river at night, and by that means we have succeeded in detecting a great number of cases.

Cross-examined by Mr. Webster.

3816. I think you were chairman of the Conservancy Committee of South Shields in 1850?—I was.

3817. I believe you were chairman of the meeting when Mr. Mather made a speech advocating the insertion of Admiralty Commissioners in the Tyne Bill?—I do not recollect it. I know I was chairman of several public meetings.

3818. At all events, you were then of opinion, I believe, that it would be expedient, looking to the many conflicting interests in the Tyne, to have some species of external control of that kind?—I was partially of that opinion.

3819. Is it not the fact that the local interests of the Tyne are very various, and at times very conflicting?—They are various, but not conflicting.

3820. As regards the two Shields, has there not been a very great difference of opinion between the two Shields as to what the works are which ought to be done?—What kind of works?

3821. Do you remember Mr. Brooks' plan of 1849, where he proposed to cut off White Hill Point by an extent of 200 feet within Mr. Rennie's line?—Yes.

3822. Was not that a matter upon which the South Shields people were directly in conflict with those of North Shields?—I never heard any North Shields gentlemen express their opinion upon it. South Shields people were always opposed to it.

3823. Is it not a matter upon which the South Shields people have expressed a very adverse opinion?—They have. I think they are justified in doing so.

3824. Do you not know that when the Coble Dean dock was sanctioned, it was a

condition which the Corporation put upon the Company, that they should carry it out to Rennie's line?—I know nothing about the Coble Dean dock.

3825. You know Smith's quay, I take it?—Yes.

3826. That is not up to Rennie's line by a considerable amount?—I think not.

3827. Assuming that the works are carried out upon the present line, and that Smith's quay remains the frontage according to Mr. Brooks' plan, that would involve the cutting off of White Hill Point?—I believe it would.

3828. Do you not recollect that in order to obviate the objections which were urged to that, Mr. Brooks proposed to put a wall and something like temporary docks, as shown on that plan, in the bight of South Shields?—I think he did.

3829. That I think is something similar to the arrangement which he also proposed at Hay Hole?—Yes.

3830. Has it not been a matter in which the North Shields party have been very much interested, to get a quay at North Shields?—It has; they have been several times to Parliament.

3831. Has not it been opposed by the Corporation of Newcastle?—I think it has.

3832. Has it not been opposed by the present Conservators?—In 1852 there was a Bill, was there not?—Yes.

3833. In 1851, after the new Conservancy came into operation, was not there a Bill for a quay at North Shields?—I think there was.

3834. Was not it then opposed by the existing Conservators?—I think they petitioned against it, merely to have the power of opposing, but I am not aware that they opposed it. I do not recollect.

3835. Was not the result, at all events, that it was reduced one both in length and in breadth?—I am sure I cannot say. I attended many meetings at North Shields when the Admiralty Commissioners were down, but I do not recollect what took place, for I did not take any part.

3836. Would it be a very important thing for the interests of North Shields that there should be a deep-water quay coming out, we will say, as far as Rennie's line?—Without reference to any line, I think it would be of importance,

3837. It must be a deep water quay there?—Yes; it would be more useful than a shoal water quay.

3838. At present, I think, there is no quay but a shoal water quay—a small quay of the Duke of Northumberland?—That is all.

3839. You say that you generally coincided with the minority, as they are called, upon this question of half-tide walls?—Yes.

3840. Have you not from first to last been opposed to Mr. Brooks' policy of high tide transverse jetties, as compared to half tide training walls?—I have been thoroughly opposed to transverse jetties per se, or even to full-tide walls.

3841. Do you agree in the opinion that these transverse jetties not only abstract the tide, but lead to eddies and make irregularities in the stream?—I think so. I think they have all the objections of high-tide walls, and a great many more besides, natural to themselves.

3842. Then as a fact, so far as you speak of having acted with the minority, all your action with them has been dictated by your objection to the engineering line of policy which you understand Mr. Brooks to recommend?—Yes; I have generally gone with them; I have always, in fact, upon that question; but I think it would be too much for us, having put so many resolutions before the Commission, and occupied so much of its time on that one question, now to come forward and complain that the Commission has done nothing, because we have obstructed the time of it; we did it from a sense of duty.

3843. You think that the matter has been pressed too far by the opponents, looking to their position as a minority in the Commission?—More than is usually the case in bodies of that sort.

3844. Although you think they may have pressed the matter too far, you have agreed with them generally in the principles which they have expressed?—I have.

3845. Having regard to the requirements of North Shields as to a quay and the cutting off of White Hill Point, and the interests of South Shields, is it not probable that there may be conflicting opinions of policy arising as between the two parties of South and North Shields?—I think there may.

3846. Have there not been such already?—I think there have.

3847. Is it not the fact, that as the Commission is at present constituted, there is an undoubted preponderance in what has been called the west end?—There is no doubt.

3848. Is it not the fact that the commercial connexions of Newcastle and the trading connexions are so extensive, as to give them a very considerable influence even at South Shields?—I do not know that they have any influence; I do not think they have any over the Commissioners; certainly they have none over me. I confer more favours upon them than they do or can do upon me. There is no class of men in the world so independent as shipowners, who give to all, and pay to all, and receive from none.

3849. Looking at what you say, is the majority of interest at the west end, and the conflicting interests which may arise even at the Shields end, do you not think, on the whole, it would be expedient to have some extraneous control?—I think all bodies having public

J. Robinson, Esq.

30th January 1855.

property under their charge should have some control; the Commissioners have a control at present. The Admiralty have a control over the river as the last appeal, and a very proper one, I do not object.

3850. Do you understand that, as matters now stand, the Admiralty have any control in the Tyne?—Yes.

3851. Have they ever exercised it for Conservancy purposes?—They have the power of restraining us if we are wasting the public property in any way, or damaging the river, which is the Queen's highway.

3852. In the new works in the Jarrow Dock Bill, for instance, and in the Northumberland Dock Bill, there is express control over the plans given to the Admiralty?—Yes.

3853. But in the Tyne Conservancy Bill is there any such control given to the Admiralty over the works which are executed on the side of the river?—I do not know that there is anything more express than the right of their position to control all navigable rivers.

(*Mr. Armstrong.*) If you obstruct the Queen's highway, so as to commit a nuisance, of course they have a control.

3854. (*Mr. Webster.*) You know that as far as regards the Parliamentary works, the Admiralty have an express control?—I think they have. With regard to the Admiralty, I may state that we were a body acting together in promoting that Commission; we had a hard battle to fight, and we were glad to grasp assistance anywhere we could, and that Bill to which my name is attached was drawn up by that Committee, and I did not make any objections to it. When the parties on both sides withdrew, at the recommendation of the Committee of the House of Commons, to endeavour to come to some agreement, it was there stated, that Newcastle would fight to the death on the subject of Admiralty Commissioners. I stated myself that I thought it was not a subject of that importance for us to fight for; I had not very strong opinions upon it; and I also, when a life commissionership was offered to me, declined to accept it, preferring rather to trust to the townsmen to be elected by them. I think a representative body is better to be solely representative, and I think that those who raise the money should have the charge of the expenditure.

3855. The shipowners, I suppose, are a representative body?—The shipowners are a large party.

3856. (*Mr. Armstrong.*) Of the constituent body?—A large party. The great bulk of the persons possessing property and paying rates in South Shields are shipowners.

3857. Or connected with shipping?—They are all either shipowners, or connected with shipping.

R. P. Philipson, Esq.

Ralph Park Philipson, Esquire sworn.

Examined by Mr. Seymour.

3858. Are you one of the River Tyne Improvement Commissioners?—I am.

3859. Are you also one of the Commissioners of the river Wear?—I am.

3860. And a solicitor?—I am.

3861. Are you largely interested in collieries?—Yes.

3862. Are the coals of those collieries principally shipped at South Shields?—Part of them are shipped at South Shields, and the remainder are shipped opposite the Hay Hole Dock; myself and partners ship annually about 300,000 tons at these places.

3863. Do you feel an interest in the lower parts of the river?—I do. If it be a question of interest, all the interest which I have is in the lower part of the river, my sole interest being to have a deep-water channel from the Hay Hole Dock to the sea, and the least possible obstruction in the shape of a bar. I have no trading interests above those points.

3864. Can you explain the proceedings connected with the North Shields Quay Bill, about which some questions have been asked by my learned friend?—Yes. The Quay Bill which was projected for North Shields, was thought to encroach too much on the valuable berthage of the harbour, and to interfere seriously with the passage of ships. There was no disposition on the part of the Commissioners to oppose a proper quay at North Shields. I will take the liberty of reading the resolutions which happened to be moved by myself on that subject on the 10th of April 1851. "North Shields Quay "Bill. A letter from Mr. Rendel, dated the 1st of April 1851, containing remarks on "Mr. Brooks' report on the line of the North Shields quay having been read, Mr. Linskill "moved, and was seconded by Mr. Stevenson, that the line recommended by Mr. Rendel "be adopted by the Commissioners, and that the clerk be authorized to meet the Town "Clerk of Tynemouth, with a view to adjusting the clauses of the Bill." That was the motion; to which "Mr. Philipson moved as an amendment, that the Commissioners are "prepared to sanction a line of quay adequate to the requirements of the town of North "Shields, but are apprehensive that the proposed quay will prejudicially affect the trade "of the Tyne, which they conceive it to be an important part of their duty to protect. "That the Chairman of the Commissioners, with the Clerk, be empowered to meet the "Mayor and Town Clerk of Tynemouth, and to confer with Mr. Brooks and Mr. Rendel, "and endeavour amicably to settle a proper quay line, and to adjust the clauses of the Bill.

R. P. Philipson, Esq.

30th January 1855.

" The said amendment on being put was carried on a division, there being for the amend-
" ment nine votes, viz., the Chairman, Mr. Dodds, Mr. Young, Mr. Cowen, Mr. Ridley,
" Mr. Hunter, Mr. Carr, Mr. Lowrey, and Mr. Philipson; and against it five votes, viz.,
" Mr. Hawks, Mr. Stevenson, Mr. Purdo, Mr. Poppelwell and Mr. Linskill." Then on the 24th of April 1851, the subject again came before the Commissioners. " Mr. Straker " moved, and was seconded by Mr. Purdo, that the line of the proposed quay at North " Shields recommended by Mr. Rendel be adopted." I then moved as an amendment, being seconded by Mr. Lowrey, " That the Commissioners feel unable to sanction the line of " quay proposed by Mr. Rendel, being satisfied that it cannot be adopted without seriously " and prejudicially interfering with the trade of the harbour. That they repeat their " readiness to agree to a quay line adequate to the requirements of the town of North " Shields, and would express their hope that the promoters of the Bill will consent so to " modify the line of quay, as to enable the Commissioners to give their sanction to it, and " that a Committee, consisting of the Chairman, Mr. Young, Mr. Robinson, Mr. John " Carr, Mr. Hunter, Mr. Poppelwell, Mr. Straker, and Mr. Brockett, be appointed to com-
" municate with Mr. Rendel on the subject, and to confer with the promoters of the Bill,
" which amendment on being put was carried on a division, there being for it twelve votes,
" viz., the Chairman, Mr. Dodds, Mr. Brockett, Mr. Cowen, Mr. Ridley, Mr. Hunter,
" Mr. Robinson, Mr. Lowrey, Mr. Young, Mr. Carr, Mr. Purdo, and Mr. Philipson,
" and against it three votes, namely, Mr. Poppelwell, Mr. Stevenson, and Mr. Straker."
It will have been observed that the original motion was seconded by Mr. Purdo, and he actually was so convinced during the discussion that what was wished was fair to Shields, that he voted against the motion which he had himself seconded, and in favour of the amendment. That was followed up by the Commissioners empowering the Chairman of the Commission and the Clerk to the Commission to proceed and meet the promoters of the Bill; they did so, met them, and a quay line was agreed upon, and there never was, from the beginning to the end, the slightest wish or desire to prevent the burgesses of North Shields from having quays erected.

3865. Did the Bill pass?—The Bill passed, but the work has never been executed.

3866. Did you attend the meeting in May 1852, when the licence was granted to Messrs. Palmer and Company to form a jetty and make a quay?—I was a Commissioner at that time, but I did not attend that meeting.

3867. In August 1853, do you remember seeing the Commissioners after receiving a communication from Mr. Palmer?—I remember at that period I had ceased to be a Commissioner. Mr. Palmer called upon me and informed me that there was some misunderstanding with respect to the quay for which he had applied at Jarrow, and I recommended him to go to the Commissioners, to explain his case to them, and discuss it with them; he is a friend of mine, and I went with him. We had some discussion on the subject, but very little, for the Commissioners were going on a view, and I do not think we were in the room a quarter of an hour or ten minutes. I then recommended him to write a letter embodying his sentiments to the Commissioners, and I beg to say, that in that I acted simply in the character of a friend, and certainly not professionally in any respect.

3868. Can you give the Commission an idea of the extent of trade of Messrs. Palmer and Company?—The object of that quay is two-fold; in the first place Mr. Palmer is a partner in the firm of John Bowes, Esq., and partners, who are the largest exporters of coal on the Tyne. The quantity of coal which they shipped from the Tyne during the last year, was 500,000 tons; supposing you added to it the portion which they converted into coke, the quantity would be raised to 850,000 tons. Mr. Palmer is also the proprietor of two extensive manufactories, employing a thousand hands, and so far as my voice went, I certainly thought that persons who shipped to so great an extent in the Tyne, and contributed also in their character of manufacturers so largely to its prosperity, should receive all the accommodation which they could receive consistently with doing nothing, of course, which would be injurious to the navigation of the river.

3869. I believe a great proportion, if not the whole of the ships which are loaded at the Hay Hole Docks are loaded on behalf of Newcastle coal owners?—The whole trade of the Hay Hole is carried on by Newcastle coal owners. I may say, although the docks where the coal is shipped are locally within the borough of Tynemouth, yet I do not believe there is a person in the borough of Tynemouth that has the slightest interest in the trade on that shore.

3876. Do you agree in the evidence given to-day by the Chairman and the Town Clerk, Mr. Clayton, that the Corporation have suffered as much as they have gained in respect of their river frontage, by the operations on the river?—Most decidedly. I think that the claims which they have had in the shape of compensation are fully equal to any value that you can put upon the land which they have acquired; and I would say also, as a member of the Corporation, that the idea of their establishing or supporting any enclosure of land for the sake of making money of it, was never entertained by any member of that body; such an idea did not enter the mind of any one of them, and as a proof of that, the land adjacent to it has been acquired not so much for the Corporation of Newcastle, about Walker and that district, as for the benefit of those holding leases under the Corporation who have built manufactories upon it, and who could not without the grossest injustice have been deprived of their river frontage. Had it not been so, the sum that must have been paid as compensation to those parties would have been enormous, because

R. P. Philipson, Esq.

30th January 1855.

it was not a mere question of the value of land, but of manufactories and buildings which the parties had established upon it.

3871. On the whole, is it your opinion that the Commission has worked efficiently?—My opinion is, that the Commission has worked efficiently; and I think the proof of it is to be found in this, that under it we have seen arrangements made for the piers, for the Hay Hole dock, and for the Jarrow dock, all measures of great importance. I beg also to say most distinctly, that I do not consider that there is any ill-feeling or ill-will on he part of the Commissioners one towards another. I believe that we are all private friends, and desirous to do what may be best for the interest that is committed to our charge. The only vexed question which remains amongst us, is the question, whether there should be half-tide or full-tide walls. On that, of course, men may differ, but they may differ without quarrelling, and I believe that we are at present approximating to a very much better feeling, and, to use an expression which has fallen from some of the other gentlemen who have been examined, if we are let alone, I have no doubt we shall be harmonious. I can say, for instance, that at Sunderland, where I happen to be a Commissioner, we have the same sort of questions, and the same discussions; but we always allow them to be settled as the majority may decide, and if we happen to be in the minority, we do not run off making a complaint to anybody; we consider that if we have had the subject fairly discussed, we must submit to the decision; it being impossible, in fact, to establish any system whatever under which the majority must not have the determination of the question. As one of that majority, I would observe that, if it could be shown that what had been done on the river was injudicious or improper, it would not be pursued. And I do not believe that there is one of the Commissioners who has an adverse feeling to the port of North Shields. I disclaim it myself altogether. I say the trade of this district must be viewed as a whole, and if North Shields increased in importance, I should be very glad of it; but I am quite sure it would not so increase without the trade of the district in which I live benefiting, and the town in which I reside also benefiting. And I say, that we have no such thing as any adverse interest of any description.

Cross-examined by Mr. Webster.

3872. So far as regards Sunderland, have not the works there been carried on under an Act of Parliament?—They have.

3873. They therefore had the plans submitted to Parliament, and approved by Parliament?—There is a river line drawn, and you cannot carry works within that river line without the consent of the Commissioners, and also of the engineer to the Admiralty.

3874. So far as regards the works which have been executed at Sunderland, they have been done under the sanction of plans adopted by Parliament?—No, not altogether; the piers, for instance, have been carried on under the sanction of the Commissioners, acting under the advice of their engineer.

3875. The works are done under the authority of Parliament, under the control of the Admiralty?—Not under the control of the Admiralty.

3876. Do you mean to say the Admiralty have nothing to do with the plans?—I mean to say, that several years ago a plan was drawn by Mr. Rennie, and that a party is not at liberty to come beyond that line without the works which he proposes first coming before the Commissioners, and secondly before Sir John Rennie.

3877. Is not that state of things which you say exists at Sunderland, namely, that there is a river line, and that no party is allowed to step within it or to go without it, one of the matters which the minority here have invariably contended for?—I do not at all know what the minority here have invariably contended for, except the question of half-tide walls.

3878. Is not the absence of a definite river line by which parties may be bound, whether expressed or not, at the root of a great number of these questions which have been raised about encroachments and walls?—I believe no such thing; I believe that the majority and minority are in perfect accordance, substantially as to where the river lines should be.

3879. Do you mean to say that the line has been decided upon?—I believe it to be understood. I do not recollect any proposition being made by any of the Shields Commissioners with reference to Shields harbour, on which we were called upon to offer any opinion.

3880. Then so far as regards Shields harbour, the Commissioners have not yet been called upon to express any opinion?—Not as regards Shields harbour, for the Commissioners, who may be said to represent North Shields, have never brought before the Commission any charge of neglecting Shields harbour; they have never brought forward works which they wished executed.

3881. You talked of there being no adverse feeling in Newcastle to North Shields. Have the Corporation of Newcastle ever spent any money in Shields harbour?—I cannot say whether they have or not. I have no doubt they have spent some.

3882. Can you tell me a single work they have done in Shields harbour for the accommodation of Shields?—While I have been a member of the Corporation of Newcastle, I do not remember any work from North Shields being suggested which they wished executed.

3883. Do not you know that an application from North Shields to the Corporation would have been perfectly hopeless?—I deny that altogether. I believe the Corporation of Newcastle have no hostile feeling towards the people at Shields; that they are perfectly ready to give to them any just attention in their power.

R. P. Philipson, Esq.

30th January 1855.

3884. You have spoken about the Quay Bill of 1851. Were you then acting under the advice of Mr. Brooks?—The resolutions which I have read were under the advice of Mr. Brooks.

3885. Had not the line for which the promoters went to Parliament received the sanction of Mr. Rendel and the Admiralty?—I do not remember whether it had received the sanction of the Admiralty, but it had received the sanction of Mr. Rendel. It was examined carefully by the Commissioners, who also had before them the fact that a great many persons interested in North Shields, thought the line came too far into the river, and would interfere with the berthage of the vessels, and so thinking, their wish was, as is expressed in the resolutions, that the line should be agreed on, Mr. Rendel and Mr. Brooks meeting together, so that all the residents of North Shields should be satisfied.

3886. Did not Mr. Brooks object to it on the ground that he insisted upon a line which should take the front of Smith's quay, cutting off White Hill Point, very similar to that upon that large plan?—I do not recollect that he did; but I know the Commissioners did not.

3887. That Smith's quay is a valuable quay, is it not?—It is.

3888. It is considerably within Mr. Rennie's line?—Yes.

3889. Then, whatever may have been the motives which influenced the Commissioners, was not the result that the quay was diminished one half in length, and also diminished in breadth?—No doubt; but still so adequate for the wants of Shields, that they arranged the matter; the Chairman of the Commissioners and the Clerk to the Commissioners met the promoters of the Bill and agreed to arrange it without coming before us after the resolutions which I have read.

3890. You talk about an agreement, but the promoters of a private Bill, with Commissioners funds to oppose them, are very likely to be forced into an arrangement?—I never found the inhabitants of North Shields loth to find money to fight any battle in which their interests were involved, and I do not believe that had any influence in the matter.

3891. Do you remember meeting Mr. Rendel upon this, which you call a compromise?—Mr. Clayton went there, accompanied with the Chairman; it was a meeting between them and the promoters of the Bill, which led to the arrangement.

3892. You have said that you believe the Corporation of Newcastle have lost as much as they have gained from the river side property. Was not there a motion made in the Corporation some time ago that the rent roll should be produced?—Not of that particular property, there was a motion made in the Corporation that the rent roll of the property should be printed.

3893. Of this water side property?—No; of the whole estates of the Corporation.

3894. Do you know the area of the land which the Corporation have formed from the river?—No; I could not undertake to say that.

3895. A great number of acres?—I cannot say the number.

3896. You have spoken about all these coals being shipped on the account of Newcastle coal owners; their places of business, I suppose, are at Newcastle?—Yes.

(*Chairman.*) We should like to see some member of the Newcastle Trinity House; will the learned Counsel agree between themselves who should be produced; we have not the pleasure of knowing any of them.

(*Mr. Webster.*) Mr. Rayne denied some of Captain Purdo's statements; I should like to ask him some questions upon that.

(*Mr. Rayne.*) After what has been said by the learned Counsel, I object to being now called upon to give evidence.

(*Mr. Seymour.*) Mr. Philipson is solicitor to the Trinity House.

(*Chairman.*) What we wish is to have somebody to speak to nautical questions.

(*Mr. Armstrong.*) The Trinity Board appoint the pilots.

(*Mr. Philipson.*) They have the power of appointing the pilots; upon that point I could give you the information. There is an Act of Parliament which devolves upon the Trinity House the power of licensing the pilots for the Tyne, both in the river and along the coast. Mr. Wake can give the information.

Mr. W. Wake.

Mr. William Wake, further examined.

3897. (*Captain Fitzroy.*) Are you an Elder Brother of the Trinity House?—No; a Younger one.

3898. How many Elder Brethren are there?—Twelve, besides the master.

3899. Do you, as a Younger Brother, take any part in the consultations, or in the arrangements of the Elder Brethren?—Not since I became harbour-master; previously to my becoming harbour-master, I had a seat at the Board.

3900. Have the Younger Brothers any share in the management of the Trinity House?—Ten of them sit at the Board with the twelve Elder Brethren, and manage all business.

3901. Have those ten Younger Brethren exactly the same authority as the Elder?—The same in voting, on all occasions.

3902. Then, you are aware of the arrangements of the Trinity House in all respects?—Yes, pretty well. It is some years since I was at the Board of the Trinity House; I am still a member, but in consequence of a byelaw made at the Trinity House, I was prohibited from holding my seat, as I took a situation under the Corporation of Newcastle.

3903. Who appoints the pilots practically, the Trinity Board? from whom do they obtain their branches?—The Trinity Board.

Mr. W. Wake.

30th January 1855.

3904. The Board, or any person acting on behalf of that Board?—The Board itself.

3905. How many members usually attend at the Board, when matters of business are discussed?—Generally, the whole of them; but I believe at present they have formed a Pilot Committee; when I was at the Board, they generally used to have the whole number of Elder and Younger Brethren.

3906. The proceedings, probably, in appointing the pilots, are much like those of the Trinity House in London?—Yes; they are examined by the Master and Elder Brethren, and by as many of the Younger Brethren as think proper to put questions to them.

3907. Under whose control is the Low Lighthouse?—The Trinity House.

3908. And the High Light also?—Yes.

3909. If the bar changes very much, whose duty is it to make that known to the Trinity House?—The pilot-master.

3910. The Ruler of the Pilots, Mr. Pearson?—Yes.

3911. Is he required to give immediate information of any particular change to the Trinity House, or is it at certain intervals of months or weeks?—At all times, when there is a favourable opportunity, he is ordered to sound the bar, particularly after any gales of wind or freshes, or anything of that kind; it is to be done as soon as possible, to see whether any change has taken place, and to make a report to the Trinity House immediately.

3912. Who has the particular charge of the marks, the means by which the pilots know how much water there is on the bar, now existing in the pilot's landing?—A committee of pilots themselves; there are twelve of them; a committee selected for settling any trifling disputes among them, and they at the same time decide those marks.

3913. The pilots settle it themselves?—Yes.

3914. The Ruler of the Pilots told us that he knew nothing of those marks?—I believe it is according to their own regulations by that committee.

3915. It is entirely among the pilots?—Yes.

3916. Supposing that any one of the pilots makes a mistake as to the draught of water, gives incorrect information, or attempts to take a ship over the bar when there is not water enough, from some mistake on his part, who interferes with him?—The owner of the ship if there is any damage, if it strikes the ground or anything of that kind, makes a report to the Trinity House, and the pilot is summoned to appear before the Board.

3917. Does the owner make his report to the Trinity House or the Ruler?—To the Ruler about taking ships, or anything of the kind.

3918. And the Ruler goes to the Trinity House?—He makes his report to the Trinity House.

3919. How often does the Trinity House of Newcastle hold its regular periodical sittings of the Board?—The first Monday of every month. They have other meetings now of Committees. The last few years they have appointed Committees for different purposes. The Committees meet at different times during the month.

3920. Can you tell us of your own knowledge what is the general opinion of the Brethren of the Trinity House as to the state of Shields harbour and the bar, as to the river mouth, and the approach from the sea being better or worse than it used to be twenty or thirty years ago?—I believe they are all of opinion at the Trinity House at the present moment that the bar is much better than it has been for some time. I frequently visit there.

3921. What do they think of the access to the harbour, the state of the Insand and Middle Ground, and the width of the Narrows? How do they consider that is as compared with the beginning of this century, or any former time?—They consider it narrower at the entrance at the Narrows; at the present time there is no Middle Ground; it grows up in summer.

3922. Do you know what is the opinion of the Trinity House generally, if there is a general opinion, upon the subject of the piers? Is the Trinity House generally in favour of the piers?—There is a difference of opinion among them as to the piers. I believe some are in favour and others not, and there is difference of opinion as to the extension of them.

3923. They are not unanimous in opinion?—No; not from what I have heard. I believe in general they are in favour of piers.

3924. Piers of some kind?—Yes.

3925. The difference is as to the mode of construction?—Yes.

3926. But there is no decided opinion on the part of the Trinity House against the construction of piers?—I am not aware of that. I could not answer that question.

Adjourned till to-morrow, at 11 o'clock.

31st January 1855.

Wednesday, 31st January 1855.

(*Chairman.*) Before the learned Recorder begins his address, we wish to ask Mr. Clayton or Mr. Cowen, with respect to some correspondence relating to the piers which we have received from the Admiralty this morning, as to what they consider the present state of the case, because Mr. Clayton seemed to think that there was some trifling misunderstanding which would be soon cleared up, and that it was not necessary for us to interfere

in it in any way. These papers include a letter from the Admiralty to Mr. Clayton on the 22d of this month. 31st January 1855.

(*Mr. Clayton.*) Which I read yesterday.

(*Chairman.*) These papers have come to us this morning, and we only want to ask you whether you consider that the whole matter will be arranged?

(*Mr. Clayton.*) I think it is a simple question of arrangement with respect to the particular duties of the engineers, which, I think, will be settled in a few days. That is my view of the matter.

(*Mr. Armstrong.*) The Admiralty seem to consider that the responsibility, not only of the plan, but of the execution of the works, should rest entirely with Mr. Walker, and they are unwilling to consent to anything else. Are the Commissioners to understand that it will be so arranged?

(*Mr. Clayton.*) I may say that the Piers Committee, which met the day before yesterday, authorized me to ascertain the terms upon which the arrangement would be carried out, on the footing satisfactory to the Admiralty.

(*Mr. Armstrong.*) Then we may take it that it is so, that the matter will be effectual, so as to satisfy those requirements of the Admiralty?

(*Mr. Clayton.*) Yes; I believe so.

(*Mr. Stevenson.*) Mr. Chairman, will you permit me, on the part of the minority, to remind you of Mr. Brooks' promise to hand in the tidal diagrams, by which he was to prove his very important assertion, that the low-water surface had been lowered at Newcastle, in order that we, on our side of the case, may have an opportunity of examining those diagrams, which, of course, we have not yet seen. There were some other very important documents which Mr. Brooks promised to hand in; one of which was a statement as to the dredging. There was also the area of the embankments within his proposed lines, which has not been furnished, and which we should like to inspect when furnished. Also a calculation of the quantity of tidal water which would be displaced by those proposed embankments. These are all very important points, bearing directly upon the subject of the Inquiry; and as soon as they are furnished, if not already furnished, I think it is proper that we should have some opportunity of seeing them.

(*Mr. Brooks.*) They will be furnished. I have first to hand in to the Commissioners one of the tables prepared for Mr. Rendel by Mr. Hepple, one of his assistants, which has been just handed to me by Mr. Stevenson. It is one of the missing documents, No. 11.

(*Mr. Armstrong.*) Does this complete the series?

(*Mr. Brooks.*) I believe it does.

(*Chairman to Mr Stevenson.*) Then, as far as this goes, are you satisfied?

(*Mr. Stevenson.*) I have expressed no opinion upon this paper at all. I see that that is one of the documents contained in Mr. Rendel's appendix, which I had got to look over at home, and which I have brought back this morning.

(*Chairman.*) It is not one of the papers which you now ask for, which you contend has not been produced.

(*Mr. Stevenson.*) Not at all; the paper for which I now ask is the proof of that very important point, whether the low-water surface has been lowered at Newcastle. Mr. Brooks has promised you diagrams to prove that, and I only call your attention to his promise, and also that we should have an opportunity of seeing them when they are handed in.

(*Mr. Armstrong.*) The Commissionors, I believe, gave directions (at least, I so understood) that there should be a comparison of the soundings of Comrie, Calver, and Brooks, so as to see what general results, or if any general results, could be deduced from it.

(*Mr. Stevenson.*) That is upon soundings already in your possession. The document which I refer to, you have not yet received; namely, the tidal observations made by Mr. Brooks in the course of the last few weeks.

(*Mr. Brooks.*) They are not yet completed.

(*Chairman.*) However, you will furnish Mr. Stevenson with them?

(*Mr. Brooks.*) He will have an opportunity of examining them.

(*Mr. Seymour.*) I promise it to Mr. Stevenson.

(*Mr. Brooks.*) Then in addition, for the purpose of enabling a decision to be come to, as to how far the tidal range has been effected in the river Tyne, I now place before the Commission the original manuscript record of the tides, by Messrs. Giles and Comrie, in 1813, which was bought during the last year by the Commissioners of the son of the late Mr. Giles. On the other side there is a tidal diagram. I also hand in to the Commission the tabular results by the late Mr. Comrie of his tidal observations in 1849, and the progress of the tides.

(*Chairman.*) I should think now, seeing that the Improvement Commissioners are in possession of these important documents, they had better be put together in some very durable way, so as to remain in their archives.

(*Mr. Cowen.*) We shall take care that they are, Sir.

(*Chairman.*) Each survey separately.

(*Captain Fitzroy.*) I see that the figures are Mr. Hepple's chiefly.

(*Mr. Brooks.*) Here are three plans which I prepared, showing the nature of the navigation in the vicinity of Cockcrow Sands in 1813, 1849, and 1854, for the purpose of comparing the real state of the navigation at those periods. Then there is a report as to some works which have been referred to during the Inquiry in the higher portion of the river at Stella and Blaydon.

31st January 1855.

(*Chairman.*) We just wish to say, in addition, that we do not take with us to London any one of the documents which have been produced here, but that we wish to return them all to Mr. Brooks, that there may be no misunderstanding as to our being charged with the loss of any of them.

(*Mr. Brooks.*) In short, they are those which are really likely to be useful during the Inquiry.

(*Chairman*) If you had a list of them they could be inspected by anybody. I may mention that it is our intention, in the course of the month of February, to send our Secretary down to superintend a comparison between the different surveys of the river, so that we may have some results which will be more satisfactory to us, and assist us in drawing up our report, than looking over these large unmanageable documents.

(*Mr. Cowen.*) I can only say, Sir, on the part of the Commissioners, that any assistance or information which can be given by us will be given.

(*Chairman.*) I am perfectly convinced of that.

(*Mr. Cowen.*) It will be something hereafter to go by. Mr. Chairman, yesterday I made reference to the caution which we took about the throwing of ballast into the river. I should like to hand in these three documents, in addition (*producing three printed notices*). One of these is by the old Conservators. The first thing that we do is, in 1851, we issue this notice, cautioning people against doing it; and, I see, in 1854, we are at it again, cautioning the people to keep it from the edge of the quays, as I stated yesterday; so that we nave done everything which the law would enable us to do.

Mr. Seymour.

(*Mr. Seymour.*) In commencing, Sir, the discharge of the duty which is now imposed upon me, of laying before you the answer which the Commissioners, through me, make to the charges which have been preferred against them by a minority of their own body, I cannot help saying at the outset that there was an observation which fell from the lips of my learned friend Mr. Webster, to which I heartily and entirely assent, namely, that the present inquiry is "an inquiry of the highest importance." I confess, for my own part, during the time that I have been at the bar, I have never felt a greater anxiety, lest through my own shortcomings, or through my inexperience in the particular technicalities and scientific subtleties involved in the engineering questions before you, I might possibly fail in doing that justice to the case of my clients which the grave trust committed to my care demands. But I have brought to the task an anxious attention to the evidence which has been given, and a deep sense of the magnitude of the interests concerned; and I therefore hope that the observations which I have to make will be attributed to conclusions formed, to the best of my judgment, upon the facts and opinions which are now before you. When we contemplate the nature of the Tyne, from its head until it discharges itself into the sea; when we consider that the very life and being, the commercial life and trade of Newcastle and of the two Shields, depend upon the condition of this river; when we listen to the hum of industry which awakes from each side of its banks during twelve busy hours; when we calculate the amount of labour which is employed, and of capital which is invested in the great manufactories which crowd its banks, I think, Sir, that my learned friend was fully justified in making the observation that this was indeed "an important Inquiry." But, Sir, if that be true, it appears to me to give rise to one or two reflections: for the more important the inquiry is, and the more the interests of these large ports are connected with the decision to which you may come, the more does it appear startling and strange at its first hearing, and when the accusation is first made, that gentlemen holding the position which the majority of the Commissioners of the Tyne do hold, that gentlemen connected with the trade and commerce, and having such a large stake in the prosperity of the Tyne, should be accused of indifference to their trust; that they should fall short in the execution of the duties committed to them; and that they should be wanting in a proper attention to the development and improvement of a navigation on which their most important interests so vitally depend. And, Sir, I cannot help saying, also, that a further reflection arises, which is this, that when such a charge is made, if it had been made by strangers, if it had been made by parties from a distance, if it had been made even by the Admiralty, or by any other public authority in this country, then perhaps it would not be open to the same observations as to the shape it has taken, and the mode in which it is sought to be substantiated, which the present charge is open to, made as it is, not by strangers, not by any public authority, or delegated commissioner, but made by a portion of that very Commission, against their own brethren, who are trustees along with them in the discharge of the same momentous trusts. It appears to me that before such a charge was made by such persons, by co-trustees in the same important interest against their fellow trustees, by a minority in this Commission against the majority, they ought to have well considered, not whether by praying in aid selected extracts from the evidence of the past, not whether by mixing up reports or decisions which relate to acts done under the former Conservancy of the river, by joining these together and by bringing forward some fresh evidence, they might ingeniously get up a specious case against their brother trustees; but that the question which ought to have been gravely and solemnly considered by them, and by them especially from the position they occupy, should have been this, whether, since the time when they entered upon the trust conjointly with those whom they now accuse, since the passing of the Act of 1850, the Tyne Improvement Commission has not, as a whole, worked well, and whether in all probability it would not have worked better but for the conduct of this very minority.

Mr. Seymour.

31st January 1855.

Now, Sir, if I may borrow an illustration from the subject which has been before us, it seems to me that the stream of my learned friend's speech did not flow through a very "regulated channel," but that it spread itself a little wide on all sides as he opened his bill of indictment against us, because he appeared to me to enter into subjects which I do not think I ought to be called on to reply to. My learned friend, for instance, spoke of the title of the Corporation to the soil, and their right to licence dues. Now the title of the Corporation to the soil is not in question before you; I am not counsel for the Corporation of Newcastle, although were I counsel for that Corporation, I believe, that with the facts before me, it would be in my power to give a full and ample answer to the argument which is used against them. But if there be a question of title to the soil of the river in dispute, there are laws, and there are legal tribunals in this country, and to those laws and those tribunals ought this question to be referred, because, Sir, the Commissioners will not step out of the proper limits of this Inquiry to pronounce judgment one way or the other as to the title of the Corporation, whether it be good or bad, in the soil. The Statute under which the Tyne Commissioners are acting, reserves the right of the Corporation, and although that is not decisive, it is strongly corroborative of the existence of the right. If Parliament considered that the right was transferred with the Conservancy, would a clause have been enacted reserving the rights of the Corporation? Looking to the language of this saving clause, it does appear to me that this consideration alone ought to have spared us from hearing many of the observations which have been addressed to you.

Then, Sir, there is another question; but before I part with the former, I think I may very properly here call the attention of the Commissioners to the answer which was addressed by the majority of the Commissioners of the Tyne to Sir James Graham with regard to this very charge. They say, in their letter of the 20th of July 1854, "The title to the "soil of the Tyne is at present the subject of contention, and will be decided by the legal "tribunals of the country, by which alone it can be properly decided. The Tyne Im- "provement Commissioners can, however, have no title to it. They take their property by "transfer from the Corporation of Newcastle, and the soil of the river is expressly "reserved to the Corporation in that transfer." And again, "The Corporation of New- "castle, to whom the right to the soil of the river was reserved in the Act of 1850, have "been in the habit of requiring small pecuniary acknowledgments from individuals for "the use of portions of the bed or soil of the river. At a recent meeting of the Commis- "sioners, Mr. James C. Stevenson moved that an application be made to the Corporation "of Newcastle for an account of those receipts." Now, Sir, I may pause to observe that here we have an instance of that pertinacity, both of disposition and of conduct, which seems to me to have characterized the proceedings of Mr. James C. Stevenson throughout his connexion with this Commission. "The Corporation replied, that inasmuch as the "soil of the river, in respect of which these payments were made, was expressly reserved "to them, there was no use or propriety in rendering to the Commissioners an account of "them. The whole amount of their annual payments is 14*l.* 10*s.*" I do not think it was Mr. Stevenson's peculiar province to raise legal questions about title, or that it was a meritorious discharge of his duty, as a Commissioner, to cause a disturbance at the Board at which he sat, by bringing forward a motion of that description; and I do not think that we ought to disturb ourselves with it now; for I respectfully submit to the Commissioners that the question as to the title to the soil between the Corporation and the Tyne Commissioners, must be left to the tribunals of the country, or to an Act of Parliament, and ought not to have been brought into discussion here.

Then my learned friend has dilated upon the question of the dues; he has talked of the coal dues; he has talked of the inadequate portion which goes to the Tyne Improvement Fund; and he has expatiated a great deal, and asked a great many questions, tending, no doubt, to the conclusion that he wished the Commissioners to form an opinion, and to express that opinion when they came to make their report, against the present destination and distribution of those dues. But, Sir, what have we, or, with all respect, what have the Commissioners to do with the question of these dues? An Act of Parliament has been passed, under that Act a Tyne Improvement Fund has been established. Towards that Tyne Improvement Fund is devoted a certain portion of the coal dues, the ballast dues, and others in the section of the Act to which I refer; and surely we are not, at least without the consent of Parliament, to enter into the consideration now whether that has or has not been properly done by the Legislature, which the Legislature have by their solemn Act sanctioned and passed; but rather we should consider the broader question before us, and leave these matters to be dealt with either by applying for a repeal of that Act, or by some other course than that of bringing them before the present Commission, which cannot entertain them without exceeding its powers.

Therefore, Sir, upon these and other points, both as to the question of the title of the Corporation to the soil, whether it is good or not, and as to the destination and distribution of the dues, and any question of that sort which may be said to arise between the Conservators of the river on the one hand, and the Corporation of Newcastle on the other; and further, as to the course which my learned friend pursued, and which appeared to me to argue beforehand that he had not much confidence in the evidence that he was going to call, namely, of referring, which he has done at such length, to the investigation before Captain Washington, or the report of Captain Washington, or any other inquiries previous to 1850, I respectfully contend that the object of the Commissioners' visit here points to a course of inquiry distinct and different from this; and that although we may refer, no

Mr. Seymour.

31st January 1855.

doubt, to the plans and principle of engineering works upon this river in former years, as tending to show whether or not a system in conformity with them has been pursued, yet in substantiating the charge, the indictment, as it has been called, against the Commissioners, I think that our prosecutors ought to stand or fall by the mode in which we have executed the trust as we found it, and the trust as we have discharged it.

Now, Sir, I find, in the petition which was printed upon the motion of Mr. Lindsay, and out of which this Commission sprang, that the minority of the River Tyne Commissioners make certain very grave charges; and as this is the first step in the course which they have taken, I will call the attention of the Commissioners to one or two passages which that petition contains.

(*Mr. Stevenson.*) Has that petition been put in?

(*Mr. Seymour.*) It has been put in.

(*Mr. Stevenson.*) I do not think it has.

(*Mr. Seymour.*) It was referred to by Mr. Webster.

(*Mr. Clayton.*) That is the bill of indictment.

(*Mr. Seymour.*) It is the bill of indictment, in fact, as it was originally 'preferred.'

(*Mr. Armstrong.*) What is the document which is now referred to?

(*Mr. Seymour.*) I am referring now to the petition of the minority of the Tyne Improvement Commissioners, asking for the Commission upon which you are now sitting; this is, in fact, the source out of which your jurisdiction springs.

(*Mr. Armstrong.*) No; our jurisdiction springs from the Royal Commission.

(*Mr. Seymour.*) It first set the matter in motion.

(*Chairman.*) Do you allude to the letter of the 3d of June?

(*Mr. Seymour.*) No, Sir; it is a petition to the House of Commons, signed by Captain Purdo, Mr. Stevenson, Captain Linskill, Mr. Poppelwell, Mr. Lamb, and Mr. Straker.

(*Mr. Armstrong.*) Upon which Mr. Lindsay got the vote of the House, which was the foundation of the Commission afterwards issued.

(*Mr. Seymour.*) Yes, Sir.

(*Mr. Armstrong.*) That is a public document, which we ought to have before us.

(*Mr. Seymour.*) Yes, Sir. After referring to the plan of operations laid down by Mr. Rennie in 1813, and asserting that Mr. Rennie's plan was not acted upon; and after alleging that the tidal area between Shields Narrows and Newcastle Bridge had been diminished 95 acres, and the tidal capacity of the river reduced 34,261,000 cubic feet, charges which have been repeated to you, and evidence in support of which has been given by Mr. Calver in this inquiry, they proceed to say, "That the majority of the Commissioners have, notwithstanding, persisted in pursuing the same system of management as their predecessors, and abusing the trust reposed in them as Conservators, have continued to alienate the foreshores of the river to the Corporation of Newcastle and other landowners, for whom the land is made, at the expense of the river funds, and by whom it is readily let on long leases at high rents for manufacturing establishments." Now, Sir, these are serious charges, when they speak of mismanaging the river funds, of improper alienations of the foreshore, and of long leases being granted at high rents for manufacturing establishments; and altogether the tone is a very high one, and the accusation is very grave. "That your petitioners, knowing the injury to the navigation which these works are causing, and the still greater injury which may be anticipated as the effect of them, is fully developed, have uniformly opposed them in the Commission, but have uniformly been outvoted by the Commissioners connected with Newcastle and Gateshead (which may be considered a suburb of Newcastle), who have a majority of votes in the Board, and who are satisfied that a few inches additional depth of water has been obtained in the upper navigation near Newcastle." Now, Sir, it has been disputed here whether or not a few inches depth of water has been gained in the upper navigation near Newcastle; but here, in the very prayer to the House of Commons for a Commission, it is admitted that there has, at all events, been a gain, and, so far, an advantage!—"that a few inches additional depth of water has been obtained in the upper navigation near Newcastle, although this slightly deepened tract has been obtained by the violent contraction of the navigable breadth and the creation of new shoals in the channel below; and although the Narrows at the lower end of Shields harbour have become very much narrower, and so tortuous, that it is only by the aid of steam-tugs that the entrance and departure of ships has not become nearly impracticable." Now, Sir, here is a petition sent to a branch of the Legislature, which has been presented very lately to the House. I cannot give the exact date; it does not appear upon the face of the document.

(*Mr. Clayton.*) The 12th of August 1854.

(*Mr. Seymour.*) Here is a petition, Sir, presented to the House on the 12th of August 1854, asserting that the Commission have abused their trust, that new shoals have been formed in the river, and that, in other respects, the navigation has deteriorated. It appears to me, but of course it will be a question entirely for the Commissioners, that they have not only not proved, but fallen far short of proving, these assertions; and that they are also equally and extravagantly remote from truth when they say that it is "only by the aid of steam-tugs that the entrance and departure of ships has not become nearly impracticable."

Now, Sir, upon that a motion was made in the House of Commons by Mr. Lindsay, which, I believe, it is very well known was not opposed by the Improvement Commissioners. I cannot, of course, refer to my own recollection of the matter, but the motion was made

Mr. Seymour.

31st January 1855.

by Mr. Lindsay, and passed entirely without opposition, either by the members for Newcastle or Gateshead. The majority of the Commissioners felt then what they feel now, that if they had committed errors in judgment or errors in fact, if they had mismanaged their trust, if they had done anything which would entitle their accusers to bring such charges against them, the sooner that matter was inquired into the better—the sooner the truth was known, and they were relieved from a trust which they could not discharge, the better; or, on the other hand, the sooner their characters were cleared from those aspersions, and the cloud was dispersed which a portion of the Commissioners had, with a selfish and short-sighted policy, cast upon them, the better. Accordingly, no opposition was offered, and the present Commission was granted. Well, Sir, what are the words under which this Inquiry is appointed, and what is the precise language of the Commission under which you sit? It is, "to inquire into the present state of the river Tyne (one of the highways for navigation "under our protection), whether the encroachments on the tidal waters of that river by jetties, "embankments, and other works executed and proposed on the banks thereof, have not "injured the navigation, and will not continue to counteract the plans for removing the "sand banks at the mouth of the river, and otherwise injure the navigation of that important "river." Sir, in this Commission, upon the face of it, taking it as I read it, it appears to me that your attention is confined, and properly confined, to the great question whether or not the navigation of the river Tyne has been improved by the course pursued under the present Commission since they entered upon their trust; and to show that I am right in so assuming, I will refer for a moment to the interpretation which the honourable Commissioners have themselves placed upon the Commission. I find that the letter which was addressed, on December the 5th 1854, by the Commissioners, is as follows:—"I am directed "by the Commissioners appointed by Her Majesty to conduct the said Inquiry, to enclose a "copy of the Commission, and to request that you will be pleased, after convoking a special "meeting of the Improvement Commissioners to receive this communication, to acquaint "me, for the information of the Commissioners, with such particulars as to the present "state of the navigation of the Tyne as may appear to you most interesting and important; "and especially, 1st, whether the Board of Improvement Commissioners, since its re-"construction in 1850, has worked efficiently; 2d, what works are now in progress for the "improvement and deepening of the River Tyne; 3d, the annual income and ex-"penditure for the above purposes, with its application in detail." Now, Sir, I appeal to the construction which the Commissioners have placed upon their own duties, whether I have been wrong in the view which I have taken. Without pausing for one moment to say what answer we might give to assertions founded upon the evidence of the past,—without admitting, which certainly I am the last person to admit, that a reference to previous Commissions or Inquiries would lead to a hostile conclusion as to the mode in which the former Conservators discharged their trust; yet I do respectfully ask the Commissioners whether I am not justified in saying that my learned friend Mr. Webster has made out no case, unless he has succeeded in satisfying the Commissioners that since 1850 the present Improvement Commissioners have failed in the execution of their trust, have not pursued a judicious system of improvement in the river, have not acted with a proper reference to the plan of operations (if that plan of operations was a wise one) pursued previously? I ask whether I am not right in contending that this is the inquiry to which our attention is now turned, and to which my defence ought to apply?

Sir, leaving therefore out of my consideration at the present moment, unless I get an intimation that I ought not to do so, those questions to which I have referred, I shall proceed to call the attention of the Commissioners to the specific grounds upon which the accusation has been made against the Tyne Improvement Commissioners, of having failed in the execution of their trust. Sir, the first charge is, that the Commissioners have been guided in their conduct by a motive of self-interest, or by a disposition to consult the interest of the Corporation, and other landowners, in the making and the reclaiming of lands along the Tyne. Now, Sir, I will make this observation at the outset. My learned friend has said a great deal throughout his case of land-making; that was a term very constantly upon his lips, and very often imported into the questions which he asked, as well as the observations with which he opened his case. But, Sir, if the principle laid down by Mr. Rennie as applicable to the Tyne, be a true one, if the principle pursued by Mr Brooks be one and the same, then land-making is the direct and legitimate result of the very principle upon which they start. You cannot 'train' the river unless you reclaim the land. Therefore, as a question affecting the improvement of the navigation, land-making must not be looked upon with prejudice, although there may no doubt be great room for complaint, if in making that improvement the motive has been not so much the paramount consideration of the improvement of the river, as a regard for the interest of the Corporation, or any other landowner.

Sir, in support of this charge, which is a very grave one, which has been repeated in very strong language, and insisted upon very stoutly before the Commission, the first observation which my learned friend makes, is upon the constitution of the present Conservancy. He says, that the Corporation have a prevailing influence upon this question of land-making, and he points to the constitution as accounting for it. Now, Sir, with regard to that constitution, what are the facts? Without going into the subject of former inquiries before the House of Commons, or previous applications for Bills, when this Act of 1850 was before Parliament, we have it distinctly stated in evidence, and it is a fact which you may now take for

Mr. Seymour.

31st January 1855.

granted, because it has not been disproved, a compromise or arrangement was effected, so that the Act was allowed to pass, and the Committee of the House of Commons was then called upon to decide what the constitution of the Commission should be. That Committee, as we have heard, was presided over by Sir John Yarde Buller, one of the most careful, prudent, and experienced members of the House; and I am sure the very fact that he sat in that chair, is some guarantee that the matter at all events was solemnly considered, and that the decision arrived at was deemed to be the best for the interests of all concerned. Now, Sir, what are the facts? The constitution of the Commission shows that there are six Commissioners appointed for Newcastle. Let us put them on one side. Let us now look to the other twelve. There are two for Gateshead; but does Gateshead possess an acre of land to which these objections can apply? Is the Corporation of Gateshead interested in any encroachments? Is there any ground for suspicion or imputation here, anything which would lead you for one moment to suppose, that whatever may be said with regard to a sympathy towards the Corporation of Newcastle actuating the conduct of gentlemen connected with the Newcastle branch of the Commissioners, that argument can be applied to the Gateshead Commissioners? Then there are two life Commissioners appointed, one of whom is Mr. Cowen, who is not a burgess of Newcastle, whose property is some miles up the river, who told you yesterday that he did not believe he had even a vote for the election of a councillor in this town, who has an interest no doubt identified with the success of the river, both above the bridge where he has property, and below the bridge, near its mouth, where he has property likewise, but has no special or particular interest, or anything whatever to control him with reference to the Corporation of Newcastle. Then there is Mr. Hunter, who as it has been proved before you is a retired independent gentleman, upon whom there is not the slightest imputation that he is in anyway whatever placed in a position which renders the decisions of his own judgment at all likely to conflict with his municipal connexions. Then, Sir, there are three representatives for North Shields and three for South Shields, and there are two other life Commissioners, Captain Purdo and Mr. Stevenson. We have therefore, Sir, the four life Commissioners, the six Commissioners for the two Shields, and the two for Gateshead; that is, twelve Commissioners: and there are six for Newcastle; and then it is said, Newcastle has a prevailing and paramount influence! Sir, whatever may be said with respect to any undue leaning which may be supposed or assumed to exist towards the interests of the people or Corporation of Newcastle on the part of their representatives, certainly it is proceeding a little too far to say that the same feeling would extend to the other Commissioners. Therefore, the argument based upon the constitution of this Commission does not apply, and the six Commissioners for Newcastle are more than counterbalanced by the other twelve.

Now, Sir, something has been said about the importance of Admiralty control. I will not allude particularly to the right honourable Baronet who now presides over the Admiralty, but I will say generally that no one can dispute the anxiety on the part of the Admiralty to perform their duties for the benefit of the country, and I should be sorry if anything which I say could for one moment be supposed to impute to the Admiralty any indisposition to be of use either by counsel or otherwise; or if a trust is placed in their hands, any wilful neglect in the execution of that trust. But, Sir, the Admiralty have great national functions to discharge. If we are at peace they have the general supervision of our dockyards, our harbours, and our coasts. If we are at war, their resources are greatly tasked, their time much occupied, and their anxious care extended beyond the confines of our own country. It is therefore to me a strange thing that gentlemen of the intelligence, as I cannot but admit, of Mr. Stevenson and others, who have taken an active part as the minority of the Commissioners, could think that it would be securing any real benefit for the Tyne, to place it under a direct Admiralty control. Why, Sir, would it cause the action of the minority, assuming it to be factious, to cease? Suppose there was a Court of Appeal in London—suppose there was a high controlling power, to which reference might be made, still would it not be in the power of the minority to cause those disputes to arise, and those questions to be endlessly agitated?—Would not immense litigation and expense be perpetually occurring, and would not the last state of this Conservancy be almost worse than the first? Sir, the Legislature in constituting this Commission as it did, considered that there should be a reasonable time allowed for a trial of the Commission, at all events during the time of the life Commissioners, who remained meanwhile free and with an unfettered authority; but it is provided in the Act, that upon the decease of two of the life Commissioners, two other Commissioners may be appointed in their room by the Admiralty. Therefore, Sir, at all events Mr. Stevenson may console himself with this reflection, that upon the ordinary calculations and probabilities of human life, some one of the four gentlemen who are life Commissioners, may be replaced by an Admiralty Commssioner. I trust the vacancy may be long distant, but looking at it as a practical question, Mr. Stevenson himself being a young man, he enjoys the probability of seeing that control vested in the Admiralty. Such, Sir, are the facts. The attention of the House of Commons was called to the nature of the Commission; the minority were heard through their counsel; this constitution was solemnly decreed by the Legislature, and you are called upon to condemn it upon the evidence which is now before you!

Then, Sir, it is said that the interests of Newcastle and of Gateshead, which they say is a "suburb of Newcastle," are paramount to the interests of the navigation, that the majority

Mr. Seymour.

31st January 1855.

in the Commission look merely to their confined local interests here, and do not consider the interests of Tynemouth, near the mouth of the river. Sir, what was the feeling of the Committee of the House of Commons? I believe no one will dispute that one of the grounds upon which they expressly took the course which they did, was that the head of the navigation was equally if not more interested than the towns at the foot of the navigation, in maintaining it in a proper and effective condition; and I think it did not require an intimation from the House of Commons to tell us that, because certainly the further you go up the navigation, till you get to the head of the river itself, the interest appears to me to increase, inasmuch as the further back you extend the head of the navigation, it is the more interested in making a deeper channel, so as to bring the advantages of which this highway is the conductor higher up the river, and nearer the place where that head is situate.

But, Sir, is it possible to look at these interests as hostile? My learned friend gravely spoke of the interests of Shields and Newcastle as being "distinct and diametrically opposed." I will not appeal to the maxims of free trade, or the maxims of free commercial intercourse between countries, but I will ask the Commissioners whether they can for a moment entertain the idea that that which is the interest of one town situated near the mouth of a river, must necessarily be considered as hostile, or as not perfectly reconcileable with the interests of another town, lying farther up on the banks of the same navigable highway? Because there is the natural and wholesome rivalry of commerce and of trade, are competing interests of necessity opposing interests? Sir, it does appear to me that if we are to compare interests, the interest of Newcastle is stronger than that of Shields in deepening, for instance, the bar at Tynemouth. Of the trade which is imported across that bar, nine-tenths we are told is trade in which the people of Newcastle are concerned, and we have been told that articles of commerce and cargoes are frequently taken out at Shields, and then sent up in heavy bottoms from Shields to Newcastle. Surely, Sir, if the bar is deepened, and that deepening is continued up to Newcastle, so that vessels can come across that bar, and make their course to the quays here, it seems to me to be even as a matter of commercial and selfish calculation, the highest interest of Newcastle to join in carrying out that object. Then again, Sir, if it is the interest of Newcastle to bring ships up, it is equally her interest, or inasmuch as the tide is later in going over the bar than when it commences to ebb at Newcastle, it is still more important for Newcastle that the tidal channel across that bar should be sufficient to allow the ships which must come up with their cargoes to get down again to sea. Sir, I confess I do think that it is taking a very narrow view of commercial interests, it is taking a very narrow view of the position of either of the Shields as compared with Newcastle, to suppose for one moment that their interests are hostile. It appears to me that their interests are one and common. They are large towns, sharing between them this great common highway, and it is the interest of all to protect that which is for the general good, and it comes with a very bad grace from either of those towns or ports to raise any such accusation against the other. The old couplet teaches a better moral:

"A general good should be a general care;
"All should unite to guard what all may share."

Now, Sir, before I dismiss the subject and this question of the alleged interests or influence of the Corporation of Newcastle prevailing in land-making and encroachments upon this river, and the general conduct in this respect of the Commissioners, I may observe upon the facts which have been proved in detail before you, and which I will merely notice in passing, viz., that it has been proved distinctly by Mr. Clayton and other witnesses called in the course of this case, that whatever benefit the Corporation of Newcastle may have gained as landowners, they have more than had a set off against that in the compensation which they had been called to make, for what? Why, for improvements at the other end of the river, and within the very borough of Shields, which they are accused of having so improperly neglected. Therefore, the Corporation say that if they have in some places gained, as is alleged, they have been called upon to pay for encroachments at Willington Quay and Walker, and elsewhere, consequent upon their attempt to carry out the recommendations of their own engineer, Mr. Rennie. And again, Sir, it is proved that the Corporation, at all events, have nothing further to get, that what work was to be done is done, and that they have no more frontage to obtain or land to be filled up. Not only, Sir, has it been done, but whatever has been done was done before this Commission came into office. Therefore, how wanting or lost for an argument must my learned friend be to have recourse to such a paltry ground of accusation against us, as to say that because the Corporation, before this Commission came into being, did derive some benefit from the engineering operations upon this river, although they have no longer any benefit to derive, yet you are now to visit upon the present Commission the errors even in judgment, or the biases of self-interest which were committed by their predecessors! Sir, here again is only an illustration of that with which I set out. It is attempted by my learned friend to build up his case upon the introduction of matters which occurred before the Commission was established, and upon charges based upon certain new evidence which he has offered, but which, I think, neither in fair play nor in common justice is he entitled to press into this Inquiry.

Then, Sir, there is this general observation to be made upon this matter. It is said that the interests of the landowner are hostile to the river, and that he is concerned in getting this land-making carried out, looking only to his own interests and not to those of the river.

Mr. Seymour.

31st January 1855.

Sir, the very accusation answers itself. How can the landowner, looking to his own interest, be an accessory to any act which will damage or disturb the river? The value of his land arises from its being situated along the Tyne; it mainly depends upon the frontage, and upon his being in a condition to support and encourage the establishment of manufactories. That applies to a great portion of the land along the river, and therefore, whether with regard to the Corporation or any personal case, it does appear to me to be an extraordinary charge to say, that it can be the interest of any landlord to disturb or spoil the common highway, which renders his own property more valuable if it be kept in a proper and efficient condition.

Well but, Sir, my learned friend is not content with general charges, he refers to illustrations. What is his main illustration? He refers to Messrs. Palmer and Leslie's case. I think it is unnecessary for me to go much in detail into these cases. You will find it has been proved before you that the fact was that, previously to Messrs. Palmer being lessees of the works which they now occupy where their important establishment is carried on, certain works, not to any very great extent, but works had been undertaken under the direction of the former Conservators, jetties had been erected, a wall had been run, and it was partly filled up in the very place where their establishment is now carried on. Sir, what then was the application of Messrs. Palmer? It is not a new application for a new licence to encroach, as my learned friend is pleased to call it an encroachment, but it is merely for permission to bring out the frontage to the proper line laid down by Mr. Rennie and not deviated from by Mr. Brooks. Messrs. Palmer's application is simply this, to be allowed to complete that and turn it into a proper quay and a proper river frontage, a proper consolidated ground along the side of the river, it having been already commenced to be done under the old Conservators, and to hasten the realization of that which, in the ordinary course of things, would have been the result in due time if no interference had been made by Messrs. Palmer at all, or no consent given by the present Conservators. Sir, when we consider that the Messrs. Bowes and Company have been referred to, when we consider that their firm ship half a million of tons of coal upon the Tyne, and that Messrs. Palmer in their iron ship-building trade alone employ a thousand men, it does appear to me that to make these charges upon these grounds, connected as this licence has been with a consideration of what is so important to the interest of the river, and of bringing a great trade upon its banks, is worthy of a very grave rebuke; at all events it deserves from me this observation, and I am sure the Commissioners will themselves see that there is some weight in it, that what was done was merely to render more efficient and to put into an effective and useful condition that which had been already commenced under the former Conservators, and which the present Commission have not sanctioned or were not asked to sanction. All that they did was this, that when Messrs. Palmer asked to carry their line along in a certain position to fill up this space by limiting it to a certain river line, the Commissioners insisted that, with a view to the general improvement of the navigation, and to the carrying out efficiently the advice of Mr. Rennie, the line of shore should be carried further forward, and by that means the interests of the river should be carefully preserved, while that which was no doubt their interest was likewise considered in the matter.

Then, Sir, there is this observation also to be made about it; that Mr. Straker, and Captain Purdo, and Mr. Stevenson, all confirm the extension of Messrs. Palmer's land.

(*Mr. Stevenson.*) There is no evidence of that.

(*Mr. Seymour.*) At all events we have no proof of a resolution to the contrary; we have the proof that they went down there, and that a map was taken there, which Mr. Stevenson would have the Commissioners to believe he never saw; we have, as I said before, the fact that these gentlemen go down in a boat to view the place. These matters are brought into consideration before the committee, and there is no resolution that I can find to impeach the statement which I have made, that the river line was adopted and carried out; and if Mr. Stevenson or any one else tells me now that he was not a consenting party, I refer him to that which must remain a far greater and stronger testimony against him than any verbal explanations now, that although constant and pertinacious in his motions, he and Captain Purdo bringing on from day to day the most vexatious resolutions in that committee which they knew they could not carry, yet you cannot find in the minute book any resolution which negatives or overthrows the assertion which I have now made.

Then, Sir, an imputation was attempted by my learned friend which I think he ought not to have stooped to. My learned friend knew as well as any man what the position of Mr. Philipson is in connexion with the town of Newcastle. My learned friend threw out some imputation that Mr. Philipson had secretly used his influence in some manner to get the application of Messrs. Palmer granted. Sir, such an imputation should not have been made against such a man. Every one who knows Mr. Philipson, either personally or professionally, in his private or his public capacity, either as a coalowner or as a solicitor, will not, I think, for one moment entertain any such idea. Sir, it is endeavoured to be brought into this case to prejudice us. But Mr. Philipson has been called before you; what is his statement? that he did not act as solicitor, but happening to meet Mr. Palmer, who was about to bring his application before the Commissioners, he joined him as a friend, and accompanied him to the Commissioners to lay the matter before them. Sir, if he had acted as solicitor, there would have been no crime in it at all events, but the fact is that he did not act as solicitor,

Mr. Seymour.

31st January 1855.

and he has told you himself, upon his oath, that he merely acted as a friend to Messrs Palmer, because he considered that they had been investing a great deal of capital in the place, and no doubt he was anxious, if this place was to be occupied by any person, that inasmuch as they were eminently desirable parties, they should not be sent away with their capital elsewhere, whether to the banks of the Tees, or the Dee, or the Wear, or any other part of the country, but that their capital should be encouraged and expended here.

Then, Sir, what becomes of the illustration, of "this flagrant thing," to use the emphatic language of my friend? Because we must not have general charges without facts to support them; we must not have broad charges laid down, and bills of indictment like this, with one count after the other, unless witnesses and evidence are brought forward. They say here that we have encroached upon the river; that we have committed these encroachments with a view to consult the interests of landowners, although hostile to the interests of the river; and they refer with an air of triumph to the case of Messrs. Palmer, which, tried with any sense of equity, was not an encroachment, but an improvement; not a departure from the line of the river, but an observance of the line of Mr. Rennie and Mr. Brooks, and which, taking it as proved before you, is at all events not a matter for which we are responsible, because all that we did was to allow that to be more completely and perfectly carried out which our predecessors in office had sanctioned and authorized before us.

Then, Sir, what is the case with regard to Messrs. Leslie? Why, just look at that trumpery and insignificant spot on the banks of this long river, which they introduce with such parade into this case, as supporting the charge which this minority, through their counsel, make against us. Sir, what was Messrs. Leslie's application? Here, again, we have this exhibited before you, with an air of triumph, as an instance in which the Conservators have regarded the interest of the landowners, rather than the interest of the river. But what is the fact? A jetty has been run out by the Tyne Commissioners, creating an accumulation along Mr. Leslie's frontage; and what does he ask? He asks permission to harden the Commissioners' mud! That is substantially what it comes to; and permission is given to Mr. Leslie to harden this mud in order to preserve his communication with the river; and what is the result of the hardening? Why, Sir, that he was able to commence the trade of an iron-ship builder; he was able to concentrate his capital upon the banks of the Tyne, and to divert into the channel of the trade and commerce and interests of this locality that which, if they had treated him with coolness or disdain, might have been sent elsewhere. Sir, I do not say that the Commissioners ought to have regarded his iron-ship building, or the employment which he would give to the labouring classes here, by the projection of that land, if the course which he was taking was an injurious one to the river; but if it is not only not injurious to the river, but tends to carry out the line originally proposed, and a line, the substance and principle of which Mr. Rennie sanctioned and Mr. Brooks adopted, surely, Sir, when we can add to that fact the other fact that we have capital concentrated there, and this source of employment to the labourers along the banks of the Tyne engaged in ship building, it ought to have led this minority still more to pause before they brought forward this case of Messrs. Leslie, which is their only case within the period of this Conservancy; their only illustration, their only evidence in support of all the charges which they have made against us. But, Sir, with how little grace does it come from one gentleman, at least, upon that minority! I, Sir, do not wish, it is not an agreeable task to any man, to impute unworthy motives; it is not an agreeable task to me at any time to be personal; but this I will say, motives have been imputed by my learned friend, and I will not even plead that as my excuse for the observation which I am going to make, because I have a higher reason for doing it. I think it my bounden duty to call the attention of the Commissioners to a fact which appears to me to explain the support given by Mr. Stevenson to the opposition made to the application of Mr. Leslie. Sir, what is the fact? Here we have about an acre of mud allowed to be hardened by Mr. Leslie, without deviation from the river line, and yet we have Mr. Stevenson himself, as an alkali manufacturer (that, I understand, is his business), filling up some four or five acres at Jarrow, which those acting with him, and he himself, with marvellous composure, declares ought not to be filled up, because the tidal receptacle ought not to be narrowed, but left in the same condition as before. I say, he who makes this paltry charge against this gentleman (Mr. Leslie) is himself a man who, without the consent of the former Conservators, without a licence (and he talks of licence), without authority (and he talks of authority), filled up some four or five acres of Jarrow Slake, and not only filled it up, but, without asking permission to do so, drove piles into it and made a communication up to his own manufactory for his own purposes. Sir, I do not mean to say that this was a great crime on the part of Mr. Stevenson. With my views upon the Jarrow Slake, I do not mean to say that it was an injury to the river; on the contrary, it was so far a service to it; but I do mean to say this, that it comes with a very bad grace from him to have opposed, as he did, with such pertinacity in the Commission, that upon a very small extent, which he himself to such a far greater extent, had pursued, without authority, further down the river.

Sir, my learned friend was not content with those observations which he made with regard to the interest of the Commissioners in assisting the making of land, but he went so far as to say that Mr. Brooks, the engineer, lent himself (for I think that was his expression) to the conduct of the Commissioners. He spoke of the "fortunate concurrence of

Mr. Seymour.

31st January 1855.

" the views of the engineer with the interests of parties against the public." Sir, I think Mr. Brooks' character can afford to survive the sneer of counsel or the malice of his accusers. I have no fear for it, and I shall, therefore, not pause to meddle with so trumpery a charge. But this, in justice to him, I will refer you to,—that Mr. Brooks has proved to you, that when, in 1828, he was engineer of the Tees (long before he received his retainer as engineer for the Tyne), the Conservators of which former river have no interest whatever in the land that is gained from its waters, he then strenuously advocated the same system of transverse jetties and of full-tide walls which he has carried out so efficiently upon the banks of this river. Therefore, Sir, I say, that Mr. Brooks has, at all events consistently with his previous operations, pursued a course which I think ought to have saved him from this imputation. And, Sir, I cannot help referring to an observation which arises now, which is made by a gentleman who I do not think has left the most pleasing impression upon those who heard his evidence. I mean as to how far his mind is free from bias, judging from the mode in which he gave that evidence. I refer to Mr. Calver. Now, Sir, that Mr. Calver is a gentleman of intelligence and an experienced surveyor; that, taking his plans on the whole, they are fairly and ably done; that he is connected with the Admiralty, and that he is a gentleman generally worthy of trust and respect, I am not going to dispute; but I am going to say this, that, like other men, Mr. Calver is fallible, he is liable to prejudice and bias, and it appears to me that he has, on this occasion, allowed the feelings of the partizan to interfere with the calm, and what ought to be the undisturbed, judgment of a scientific or professional witness called before a Commission like this. Sir, so early as December 1853, I find a letter from Mr. Calver, to which I shall have hereafter to refer, but in which I find the following statement, addressed by him to the Admiralty. After using some rather strong terms with regard to the conduct of the Commissioners of the Tyne, he says—" Secondly. The parties carrying out the embankment at Jarrow " are under the name of Palmer, Brothers, and Co., and it is currently reported that the " firm either numbers among its members or is intimately connected with several gentle- " men of local influence." Now, Sir, is it fair, or is it to be sanctioned, that a gentleman connected with the Admiralty, a man holding a public position of this kind, is thus to insinuate charges, which, so far as they find belief in the place to which they are sent, must have a very prejudicial effect upon those gentlemen against whom they are directed? I should like to know what he means by talking of several gentlemen of local influence being connected with Messrs. Palmer. Messrs. Palmer are large capitalists, who have extensive manufacturing interests, and of course are acquainted with " gentlemen of local influence." But does he mean that they use their intimacy with those " gentlemen of local influence" to obtain a sanction for things inconsistent with the interests of the Tyne navigation? If he does, I only say he should have referred to something stronger than the slanderous whisper of a disaffected Commissioner before he sent such a letter as this to Her Majesty's Admiralty.

But, Sir, there is one passage there still more deserving of this observation, to which I must refer; a passage assailing not only the character of the Commissioners, but the character of Mr. Brooks, which is this—" Mere personal and private interests dwindle into " insignificance before the national importance of such a question," that is, enclosing the river. " No doubt these encroachments afford a cheap means of obtaining land, and " as local authority and compliant theories are to be found in their support, boundaries are " advanced, and land obtained accordingly, although it be to the weakening of the river " and the decay of the public interest in it." Now, Sir, here is Mr. Calver in 1853, the same Mr. Calver who was examined as a witness before you during this Commission, reporting to the Admiralty upon the influence of gentlemen of local importance, and then actually asserting that " local authority and compliant theories" are used to weaken the interests of the river, and to advance its foreshore at the expense of its navigable channel. Sir, where is Mr. Calver's proof of that assertion? It is here—Messrs. Palmer and Messrs. Leslie. They are the proofs of it, and what becomes then of the charge? All I can say is, that if you are to take that as an instance, it exhibits a little strong feeling, to say the least of it, a prejudiced opinion to speak with the greatest caution, and it may assist you in coming to the conclusion that you should not place too high a value upon the supposed disinterested motives of a minority who rely upon such a witness as their foremost authority.

Sir, so far I am sure the Commission will feel that it is only from a sense of duty I have thought it right to make these observations. Something was said about my postponing my speech till I went to London. Sir, that might, in many respects, have been convenient to you, and more agreeable to me, but I feel that this is an investigation into the conduct of a Commission appointed after solemn consideration, under an Act of Parliament, who are, by a section of their brethren in that trust, accused of what almost amounts to a misdemeanor, because they are charged with doing that which is an injury to the public, which cuts at the root of the common interest of the community, with a wilful departure from their duties, and a wilful mismanagement of the trust reposed in them; and therefore, Sir, I do feel that I should not be discharging my duty if I did not at once obtain permission to test the nature of the charges which have been made, to sift the grounds upon which they are rested, and to call the attention of this Commission to the great necessity which there will be for caution and care, that you may see, step by step, why those charges have been made, who have made them, and what is the evidence which is laid before you in support of them!

Mr. Seymour.

31st January 1855.

Sir, the next question is a question somewhat cognate and analogous in its character, but a question which I shall be able to dispose of more speedily. It is, however, one still involving a grave imputation upon the conduct of the Commissioners, and one which, I think, rests upon still less foundation; because here, not only is there no evidence to support the charge, but the very evidence given by those who accuse us is the strongest evidence in favour of those who are accused. I allude, Sir, to the assertion that, in the execution of their trust, the interests of North Shields, to quote the words of my learned friend, of which I have made a note, "have been utterly neglected, and the "very money derived from Shields' interests expended almost exclusively to the benefit "of Newcastle." Now, Sir, when I talk of my learned friend, of course the Commission will bear in mind (and if he were here I would say the same), that I have the greatest respect for a gentleman of his ability and legal information, and that I speak only of those who instruct him, and have, during these proceedings, sat behind him. Who his immediate instructor is, I know not. It appears to me, that to the amateur engineer, Mr. Stevenson has added the rather anomalous position of figuring as amateur attorney, for he sat at my learned friend's elbow, and has acted to-day as attorney in his absence. However, the charge is this, that the interests of North Shields have been utterly neglected, and the very money derived from Shields' interests expended almost exclusively to the benefit of Newcastle. Now, Sir, I have already referred to the general observation, that supposing it true, that money to a considerable extent had been expended upon the higher parts of the river near Newcastle, I should respectfully contend, that the interests of Shields are not neglected by that expenditure, because, if the principles laid down by Mr. Brooks are sound, then the argument is correct, that an expenditure upon the higher parts of the river is an expenditure for the interest of the lower part also. Of course, there may be an error in my opinion, or in Mr. Brooks' views, but if he is right in thinking that the works ought to be commenced at the head of the river, and then go down to the mouth of the river, and if I am right in my argument, that the interests of Newcastle are even greater, or certainly as great as those of Shields in the efficient maintenance of that river, then, Sir, I think that even if it were proved that money had been spent at the Newcastle end of the river, it would be no proof, certainly not convincing evidence, that no regard was paid to the interests of Shields. I should contend, that so far as money has been spent anywhere in the river, so far the interests of Shields have been consulted. But what are the facts? What are the works which have been carried on by the Corporation, and which the Commissioners are doing? There are the Hay Hole Docks. In what borough? In the Borough of Tynemouth. There are docks which will be capable of holding 500 ships; docks so situated, that some day there may be streets running connecting the streets of Tynemouth with these very docks; docks which at a moderate computation will be rated for Tynemouth Proper, and to the funds of Tynemouth upon the sum of 20,000*l.* per annum; and although they will get the direct benefit of the rate upon that amount, and although they have these docks, and the trade consequent upon them brought within their own borough, yet the North Shields people turn round and say, "Why, you have done nothing for us!" But have we built or patronized docks in our part of the river? What docks have we built or got others to build near Newcastle? Are there any docks or any similar works above or below the bridge to which they can point.

But, Sir, let us look across the river, let us not confine our observation to that side. Where are the Jarrow Docks? They are in South Shields. Does that fact at all increase the animosity from the opposite shore? Does the jealousy which exists towards Newcastle poison also the feeling of Tynemouth towards South Shields; and, because 500 ships can be accommodated at Hay Hole, do they regard their feelings as insulted, and their rights as neglected, and are their jealousies awakened, because there are 500 ships to be also accommodated at Jarrow? I ask the question. Is there any fact to prove which way the answer ought to be? At all events, we have the fact, that at Jarrow also docks are being carried out, and that both these works are done towards the end of the river. My friend Mr. Clayton, says that the works at Jarrow will be done by the Railway Company, but with the sanction and support of the Commissioners. But I think I can still show an illustration of how far the interests of the river are more dear to the Commissioners than anything which can be supposed to be their own selfish interest. Some of the Commissioners had made what they considered a very good bargain with the Dean and Chapter for the acreage which would be employed in the Jarrow Docks; they got it at 30*l.* an acre. They might have carried out this great work themselves; they might have regarded it, looking selfishly at the matter, as an important consideration that they should have a power and influence over these docks when made. But, what is it they do? Why, Sir, satisfied that the North Eastern Railway Company can more efficiently complete these docks, they keep their own interest in the background, and hand over the docks to the Railway Company for the interest of the river. I thank, therefore, my friend Mr. Clayton, for his interruption. Of course, when I speak of the Commissioners now, I am speaking of those who acted in support of the Jarrow Docks. The majority, who thus acted in the matter, appear to me, by the very conduct which they have pursued in this instance, to have shown an exceedingly proper and disinterested disposition.

But then, Sir, we have heard evidence in this case about the expenditure upon the moorings. Now moorings in the Tyne are provided for by a distinct fund, which is known "as the mooring fund." That fund is at the disposition and discretion of the Commissioners. They may spend it at Shields, or they may spend it elsewhere: they may put down a mooring at Newcastle, or they may take it further up the river. What have they

Mr. Seymour.

31st January 1855.

done? Why, Sir, not only have they spent every shilling of that money, or very nearly so, but they have gone to the river fund; they have drawn upon the Tyne Improvement Fund, and if I may so speak, have mortgaged it for the purpose of increasing the moorings in Shields harbour. Sir, it does appear to me that that is one of those acts which, at first sight, would seem to be a misappropriation of a portion of the river fund, to supply that which the mooring fund did not afford. But surely, Sir, if there be justice anywhere, if strong engineering opinions have not eradicated the principles of fair play between man and man, I ask you, are the people of Tynemouth to turn round, and through their representatives gravely say, "You have done nothing at our end of the river, "although you have built the Jarrow Docks on one side and the Hay Hole Docks on the "other side, and although you have expended this money out of the mooring fund, and "afterwards made a further expenditure out of the improvement fund?"

Sir, what do these "know-nothings" next adduce as an illustration of these "do-nothings?" They refer to the Quay Bill. They say, "You have never given us a quay." Whose fault is that, if you have had neither public spirit nor money enough at command to do it? We have assisted you to get the power. What was the fact, Sir? A Quay Bill was applied for in 1849, and without hearing the opposition, it was thrown out upon its own merits, or rather its demerits, by a Committee of the House of Commons. That was before our time. But questions have been asked about it in the course of this Inquiry. We are accused of giving no quay. We say, we did give you, at all events, all you asked; we gave you all the power you required; we had other works to do. They go for a Quay Bill to the House without our aid, and they lose it without hearing the opposition. Their own case was suicidal. Then they come in 1851, and say, "Will you help us in getting a Shields Commission, and in getting a new Quay Bill?" They do get it, with power to a Commission to execute it; but it is found better afterwards, seeing that their Commission would not work without pay, to get up a Joint Stock Company. Captain Linskill is all enthusiasm; quite a pattern promoter. A Joint Stock Company is got up; that is "got up" on paper; and what is the result? These gentlemen, who are so loud upon their own merits and efforts for the Tyne, have not had public spirit to carry out that Joint Stock Company, or energy enough to raise funds to build a quay; and so the Quay Bill and the Company are both dead letters.

Sir, I shall now call the attention of the Commissioners to the resolution which was alluded to by Mr. Philipson yesterday upon this subject, and which it is convenient I should refer to here. "Mr. Straker moved, and was seconded by Mr. Purdo," these Siamese twins in opposition—these 'antiquated imbecilities,' if I may adopt a Parliamentary expression, "That the line of the proposed quay at North Shields, recommended by Mr. Rendel, "be adopted." Mr. Philipson moved, as an amendment, and was seconded by Mr. Lowrey, "That the Commissioners feel unable to sanction the line of quay proposed by Mr. Rendel, "being satisfied that it cannot be adopted without seriously and prejudicially interfering "with the trade of the harbour. That they repeat their readiness to agree to a quay line "adequate to the requirements of the town of North Shields, and would express their hope "that the promoters of the bill will consent so to modify the line of quay as to enable the "Commissioners to give their sanction to it; and that a committee, consisting of the "Chairman, Mr. Young, Mr. Robinson, Mr. John Carr, Mr. Hunter, Mr. Poppelwell, "Mr. Straker, and Mr. Brockett, be appointed to communicate with Mr. Rendel on the "subject, and to confer with the promoters of the bill; which amendment, on being put, "was carried on a division, there being for it 12 votes, viz., the Chairman, Mr. Dodds, "Mr. Brockett, Mr. Cowen, Mr. Ridley, Mr. Hunter, Mr. Robinson, Mr. Lowrey, "Mr. Young, Mr. Carr, *Mr. Purdo*, and Mr. Philipson." There is the inimitable Captain Purdo, who accuses us sometimes of imposing upon him, who seems in this instance, at all events, to have imposed upon himself; for he is so convinced by the opposing arguments, that the unnatural parent slays his own child; he first seconds the resolution, and afterwards assists in negativing that which he has previously seconded. That is the minute which is recorded. Sir, with what grace do our accusers appear before you? Are we who have built you your Hay Hole Docks—we who have spent our money upon your moorings—we who have let you have your Quay Bill, which you have not the spirit to carry out, to be turned round upon and accused of having done nothing for the Shields end of the river.

Then, Sir, they say, "You have expended it all at Newcastle." I have taken down my learned friend's words: "The very money derived from Shields interests has been ex-"pended almost exclusively to the benefit of Newcastle." Have they proved that we have expended one farthing? Not one; not a tittle of evidence has been given. Not only has it not been proved by them, or attempted to be proved, but we have disproved it ourselves, and upon cross-examination their own witnesses have admitted it. Has a quay been built? has a pile been driven? has a shed been erected? has there been anything done at our part of the river? While we are using our private influences to conciliate landowners at the Hay Hole Docks, and while we are doing everything in our power to increase the trade and further the general interests of their part of the river. Sir, I do say that if the minority in the Commission can only bring forward such charges, it is well they have been brought forward. I believe the result will be, that this Improvement Commission, as far at all events as its majority are concerned, will stand higher and on a surer basis than ever; and from their conduct being seen in the daylight, and the facts being published to the world, any feeling excited against them in high places will be allayed, and the motives of my honourable clients will be redeemed from all suspicion, and vindicated against every slander.

Mr. Seymour.

31st January 1855.

Then, Sir, it is said that the Shields interests are prejudiced by the works not being commenced lower down the river. Sir, we have had Mr. Ure here from the Clyde; we have had Mr. Brooks, who says that he was formerly engineer of the Tees; we have had some evidence, I think, also, with regard to the Tay and the Ribble, and it appears that in all these rivers, like many others that might be brought before you, the works began at the upper end and went downwards. The principle of Mr. Brooks is, that by directing the current of ebb and tide into the same channel; by bringing the waters, both fresh and tidal, to flow with a regulated volume, he will so increase the scouring influence of the river upon its own bed as to improve the navigation throughout, to remove its shoals, and to render it generally a deeper and safer highway. Sir, if his principle be right, beginning at the upper end of the river seems the course most consistent with common sense, as well as with the principles of scientific engineering. But, Sir, we are accused of a want of uniformity of system, and one of the honourable Commissioners was good enough yesterday to refer to a passage in the report of Mr. Rennie which I considered at the time, had it been read by those who accuse us, would have led them to be cautious before they made the accusation, because their charge is, You have deviated injuriously from Mr. Rennie's principle, you should have begun at the mouth, and not higher up the river. What says Mr. Rennie? "The works that strike me as most material to be done "first are those which tend to direct the river in a straight or at least a uniform course, "where it is most interrupted by sand-banks." Now they say that we have commenced up at Walker, or Willington, or Hebburn, or other places where the very works which are done show the object which we had in view, and in doing so we are only carrying out the principle recommended by Mr. Rennie. Mark the inconsistency of our accusers; at one time they take a garbled passage from Mr. Rennie, point to it, and say, You ought to have begun as Mr. Rennie here directs, and you are not good engineers and efficient trustees because you have not done so; and the next moment, when we have clearly and confessedly followed the advice of Mr. Rennie, they stigmatize our proceedings as unsystematic and unsound. Then they say, You have "gone on bit by bit," and the improvement of the river ought to have been undertaken as a whole; and these gentlemen who have been so pertinacious in preventing the accomplishment of anything, seem exceedingly ready to condemn our not having done everything at once! But what says their great authority, Mr. Rennie? "Where the channel of the river is to be materially changed it should be "done gradually, for if it were done otherwise the sudden effect produced would greatly "impede the navigation." Therefore, Sir, we have the opinion of Mr. Rennie upon it as an engineering question; as a financial question, perhaps, there may be reasons for it. If Mr. Robert Stephenson was correct in his view, that the beau ideal of a river was one whose stream "ran between parallel quays from one end to the other," and if that is "the "consummation devoutly to be wished," by those engineers who agree with Mr. Brooks, all I can say is, that it appears to me that you cannot visit upon Mr. Brooks his not carrying these things out with greater rapidity, for even his pride would stimulate him in doing so; but when he has had such opposition to meet with in the Commission itself, and when, besides that, we have had our funds expended upon these moorings, and in various other parts of the river, it seems physically and financially impossible to carry out that with the nonperformance of which we are now so roundly accused by these gentlemen.

Sir, before I pass away from this observation, there is just one thing which I would say. There is no fear of any such accusation against the people of Tynemouth, or, I may say, the people of South Shields, as that they are interested in making encroachments upon the river. The fact is, that North and South Shields themselves stand upon the result of previous encroachments; North and South Shields stand as close to the margin of the Tyne as encroachments upon the previous condition of the estuary will allow them to do; there is no land there to be "*made.*" What the consequences would have been, if there had been, of course looking to Mr. Stevenson's conduct at Jarrow Slake, we need not now conjecture; at all events, it is a fact which I may notice in passing, and, as I am reminded by Mr. Brooks, they have got a good deep-water harbour as the consequence, which, so far as it goes, is an illustration and an example in favour of the engineering principle upon which he has acted.

Sir, I hope I have now disposed of these charges. I have carefully read this evidence. I am sure I have spared no anxiety and labour to make myself, as far as I could, master of a question to me exceedingly novel and difficult, but the conclusion to which I have come upon this evidence is, that, whether as regards the question of the interest of the landowners, or of the Corporation as landowners, viewed in connexion with the discharge of their duties by the Commissioners, or as regards the interest of North and South Shields, as contrasted with the interest of Newcastle, not only is there not a single tittle of proof upon which the Commissioners can come to the conclusion that my learned friend's accusations are founded in fact, but the proof is all the other way, and witness after witness has established a cumulative amount of evidence, all of which are so many vindications of the character of my clients, the Tyne Improvement Commissioners.

Sir, the next accusation which has been very much insisted upon, as the Commissioners will, I am sure, agree with me in saying, is, that there has been a want of system in the course of carrying out the operations of the Commission. If my observations with regard to the conduct of the minority apply anywhere, I must say that they do seem to me to apply most of all here. Let us take Captain Purdo, for instance. He is a most respect-

Mr. Seymour.

31st January 1855.

able man, almost a friend of my own, for he was very lately a constituent of mine at Sunderland, although we were opposed politically, and his agreeable manners make him a favourite among his acquaintance. But Captain Purdo has certainly a very strong opinion upon a question, upon which, perhaps, he is not the best man in the world to form a correct conclusion; a difficult engineering question, upon which it requires a great deal of scientific information and practical experience to come to a correct conclusion. He says he pins his faith to Mr. Rendel and Mr. Rennie. He may pin his faith to some passages taken haphazard from Mr. Rendel; but I will pin my faith, and my cause too, to this, that the course which Captain Purdo has taken does not find any warrant in the views expressed by Mr. Rennie. Sir, he says we have done things without a system. How long have we been in office? Since 1850. You have had the dates when the various operations were commenced given to you by the successive witnesses. But it is said that since the present Commissioners have been in office, they have gone on "tinkering" (that was the elegant expression of my learned friend; I do not say it was original; perhaps it was supplied to him from the *Shields Gazette!*), without any plan, just as it suited the particular interest, or emergency, or object of the moment. Sir, I say this is a gross and unfounded charge; because I can find no evidence to support a charge of this kind, that they have consulted the mere emergency, or interest, or object of the moment. What is the emergency, or where is the interest, or can the object be defined, which has been regarded by them, if not the general improvement and deepening of the entire navigable channel of this river?

Sir, our accusers say that we have acted without any system. Instead of undertaking myself to lay down or explain an engineering principle, I may refer to a pamphlet which is already in evidence. I mean the pamphlet by Mr. Brooks on the "Improvement of Tidal Navigation and Drainages." Mr. Brooks thus expresses his opinion, and it appears to me that I shall consult better for his reputation and my own, if I trust rather his book than my own definition of his views. At pages 9 and 10 of that pamphlet he writes as follows:—

"The tidal energy or power of a deep-water navigation may therefore be greatly superior "to that of a shallow one, although the latter may be of greater area as a tidal receptacle, "and may possess an equal rise and fall of tide at its mouth. In the former example, or "that of a deep-water navigation, contracted within proper bounds, the entire cubic con-"tents of the receptacle will be nearly filled by the tide at the time of high water; but in "the other, the ebb will have fallen considerably on the bar, long before it is even high "water, at only a few miles above. In the one case the receptacle is well filled, in the "other it is never properly emptied, nor is the space above it ever effectively occupied by "water, so that extensive lateral enclosures may be made without really diminishing the "effective tidal volume. The mass of tidal water received by these shallow rivers is of a "wedge form, whose vertical dimensions are included between a line formed by the sur-"face of the water at the instant of low water on the bar, and another line consisting of "the surface of the tide at the instant of high water on the bar. Bearing this fact in "mind, it is not difficult to conceive cases where the tidal receptacle may not be half "filled. In the cases where reclamations of shallow portions of the channels have taken "place, involving an apparent diminution of the tidal receptacle, it should be borne in "mind that such parts are only occasionally covered by the tide, whereas the augmenta-"tion of the tidal receptacle, which takes place by the depression of the low water surface, "is felt at every tide. In thus pointing out the leading features of a good or a bad state "of navigation, the proper means for remedying the latter are naturally suggested, and it "is unnecessary to make any observations beyond saying, that the author's own practice in "training the current of a river consists in first constructing full-tide timber groins or "jetties, at right angles to the course of the intended new line of river frontage, and which "he has found to cost from 12*s.* to 30*s.* per running foot." Then he states that such works have been objected to "from their immediate action" producing irregularities or holes close to the ends of the groins. This effect does take place for a time, but it must necessarily cease with the existence of the eddy which produces it. "The irregularities only "exist while the spaces between the groins are being converted into land;" and he proceeds to refer to the effect of freshes and other sources of supply to the channel of the river, and the effect of a river of this description, as connected with the general drainage of the country. Sir, on turning to Mr. Rennie's report, which was read yesterday, and which I need not now more particularly refer to, I hope the Commissioners will agree with me, that I am not straining the facts, when I say that it does appear, looking to that report, not taking a single passage by itself, but looking upon it as a whole, that the principle which is there asserted by Mr. Brooks, and which, I believe, is his guiding principle in the course of his operations upon this river, is exactly in consistency with the principles laid down by Mr. Rennie.

Now, Sir, the old Conservators made, as we are aware, some works. The first works under the old Conservators were made on Mr. Rennie's line at Walker, and we have had it already proved that in the first instance, by an adherence to his plan, considerable injury was done by creating a shoal in the neighbourhood of the Hay Hole channel. It was Walker or Willington, the Commissioners will recollect the part of the river to which I refer.

(*Mr. Brooks*). Willington.

Mr. Seymour). Sir, on the 16th of January 1843, a report was addressed to the Com-

Mr. Seymour.

31st January 1855.

missioners by Mr. Brooks, recommending a partial deviation there, and certain changes which he considered would counteract the evil which had then been effected. Sir, it is said that we have deviated from Mr. Rennie in carrying out the object of Mr. Brooks, in counteracting that evil influence which arose from an exact adherence to Mr. Rennie's views. The answer to that is a reference to Mr. Rennie's report itself. I think I may refer to one passage which, as it appears to me, shows that Mr. Rennie himself anticipated a departure from the lines which he laid down here. He says, "The lines of contraction "laid down by me are not, however, regular; they are always wider where the turns are." And after going on for some time, he says, "It is possible, however, that experience may "prove that these spaces should be still further contracted." And then he speaks of the contraction of the spaces in the Clyde. Without going more fully through this report, it does appear to me that Mr. Rennie clearly anticipated the possibility that in the increasing demands of trade, in the development of the coal traffic, and the erection of staiths for that purpose along the river, it might be rendered necessary in carrying out the desired object afterwards to make certain deviations, and agree to a compromise between existing interests and projected improvements. The question for the Commissioners will be, whether in making those deviations Mr. Brooks has or not obeyed the principle that was recommended by Mr. Rennie.

Now, Sir, has Mr. Brooks no authority in support of the lines which he has adopted, or the partial deviation which, having a great principle in view, he has pursued? I find that the following evidence was given by Mr. Rendel before the Committee on the Tyne Conservancy Bill on the 5th of June 1849. In reply to the question "I ask if Mr. Brooks' "lines are sufficiently good to be adopted by the Corporation, whether in your opinion they "are so?" he says, "Generally speaking, I have not the slightest grounds for objecting "to Mr. Brooks' lines. "But there may be some cases in which, if the thing had to be "gone over again, you would suggest some alterations?" "Yes, but I think they would be "very trivial." Sir, here is the evidence of Mr. Rendel, a witness of great importance upon this subject, strongly in favour of the course which has been taken by Mr. Brooks.

Then, what says Sir William Cubitt on the same occasion? "Comparing the state of the "sand beds with what you remember as previously existing, is there or not an improvement "in the river Tyne?" "A very marked improvement, a striking improvement, especially at the "Shields end, the neighbourhood of Shields." "There is a deviation of the river line made "by Mr. Brooks in the bight above Bill Point?" "Yes." "Do you consider that that was "a judicious departure from Mr. Rennie's line?" "Yes; I think it was judicious and pro-"per, because it is as good a navigation still there now as I think there can be well effected." "Mr. Rennie proposed a different line to Mr. Brooks at the point at St. Anthony's?" "Yes; "he proposed taking off several of the high points, which I submit were not necessary." "Sup-"posing the expense necessary for the carrying out of Mr. Rennie's line to be gone to, do "you think the result would be anything like worth the money?" "I think not. I think the "river may be made quite equal in point of depth and capacity, as was laid down in "Mr. Rennie's plan, at much less cost than by adhering to his lines." There you observe Sir William Cubitt draws a distinction between the plan, which shows the principle, and the lines, which merely carry out the principle in detail. "I again say his lines represent the "principle of improvement. That has not been departed from." Now, Sir, I pray in aid of Mr. Brooks, who is as it were upon his trial before you, the opinion of Mr. Rendel and Sir William Cubitt as supporting the argument which I am now addressing to you, viz. that Mr. Brooks has pursued a consistent line of operations, that the previous Conservancy in 1816 had received the report of Mr. Rennie, upon which they acted in carrying out the works at Willington, that these works, though upon Mr. Rennie's line, created an injury, by sending shoals up in the way of Hay Hole bight, that Mr. Brooks then made a partial deviation no doubt, but in so doing did not violate a general principle, and that he has not therefore departed from the guiding lines of Mr. Rennie.

Sir, in support of this charge of want of system, the principal evidence which was relied upon was not that these slight deviations were made from these lines, for we find afterwards some remarkable evidence upon the subject of lines in the minute book; but the principal objection seems to me to be that there was no plan, that there was no obtaining information as to what was going to be done, that the things were done without system and without uniformity, and that Mr. Brooks supplied no plan, and the Commissioners were not sufficiently active in procuring it, and therefore the gentlemen of the minority in that Commission could not obtain it. Now, Sir, it does appear to me that this comes very strangely from my learned friend, because if I remember rightly, after making all these assertions about the absence of a plan, Mr. Webster produced a plan which was used in 1849 by Mr. Nicholson with Mr. Brooks' lines upon it. Therefore I think there was a great deal in the question which was put by Mr. Brunel to Mr. Stevenson, as to how he could reconcile with the production of that plan his statement of his not having had access to any plan with Mr. Brooks' lines upon it. But, Sir, what are the facts? Why, we have been deluged with plans. Mr. Stevenson, moreover, when he was called before you as a witness, produced a number of reports, and he said there were a great many more. He produces the report of 1843, in which a plan is distinctly referred to. He is asked "Was "not that plan produced at each meeting when any work was going to be carried on, so "that reference could be made to it?" What is his answer? "Oh yes, it was produced." But when he is pressed it amounts to this, that the Commissioners did not think it proper

Mr. Seymour.

31st January 1855.

to keep a couple of footmen to hold the plan open to catch the languid eyes of Mr. Stevenson! It is the most ridiculous thing I ever heard in my life. Because the plan which is laid upon the table is not opened wide enough for Mr. Stevenson to satisfy his curiosity, without taking his hands from his breeches pockets, therefore he comes forward and makes the assertion that there is no plan, and nothing from which he can derive information. Sir, I think when we regard the evidence upon the production of that plan, and the fact that it is proved by witness after witness, that it has been laid before meetings of the Commissioners, and the admission by Mr. Stevenson himself, though very reluctantly, that he has seen that plan, the accusation vanishes and resolves itself into nothing but strong feeling on the part of some members of the Commission either towards Mr. Brooks or towards his views, or some other reason which I cannot supply, and which for my own part I am not called upon to suggest. But besides that plan which was before the Commissioners, it also came out upon cross-examination that a copy of Mr. Rendel's and Mr. Brooks' plans was sent round to each of the Commissioners, and that Mr. Stevenson himself has shown us the best possible proof that he was in possession of such a plan by its production. Therefore to say that there was no plan, and no facility of access to one, appears to me to be a very strange charge; and I should take the liberty of addressing to Mr. Stevenson the common maxim—

> "Whate'er you say, keep probability in view,
> "Lest men suspect you when you speak what's true."

Sir, I shall now proceed, as rapidly as I can consistently with the discharge of my very solemn duty, to call the attention of the Commissioners to the evidence which my learned friend brought forward in support of his next charge, which was, that the river within the time of this Committee has not improved, but has deteriorated. The first witness he called was Mr. Straker. He had previously spoken of him as a very leading gentleman, and as the father of the movement at Shields. You will easily remember him as a witness who referred in rather a startling manner to a name unutterable to 'ears polite;' who said he would prefer the Devil himself as a Tyne Conservator; and who showed from that illustration that he sometimes lost his temper and was capable of conducting and of expressing himself in rather a strong manner. Mr. Straker complained very much about the encroachments at Willington quay. He referred to the Howdon dock, of which he himself was tenant, whether that had any influence upon his judgment in the matter or not, I do not know, but whether it had or not, what is the fact? That these encroachments were the works of Mr. Anderson, that they were done before 1850, that they were inflicted by carrying out with too accurate an adherence to the principle and plan of Mr. Rennie; and therefore to make that a complaint against us may gratify a feeling of resentment, but cannot be evidence of misconduct on the part of the present Commissioners. However, he admitted "as far as the bar is concerned, I cannot say whether it is better or "worse." This is a witness brought forward to give an engineering opinion, and to speak to that which is from beginning to end the foundation of my learned friend's case, namely, the condition of the bar. Here is Mr. Straker brought forward the first witness to substantiate this charge, and what is almost the first thing he says, "as far as the bar is concerned, "I cannot say whether it is better or worse." He admits, however, upon cross-examination, that with north-east gales and freshes, it improves. Now that admission by Mr. Straker, I consider very important, because there has been some question here as to the governing influence of floods upon the river. Here we have a distant admission from Mr. Straker, that there are times when the bar improves, and that one of the influences under which it improves is the influence of freshes, an admission under the circumstances which I consider of some importance, as a confirmation of the views which were expressly maintained by Mr. Brooks and Mr. Taylor in the course of the evidence offered on the part of the Commissioners.

Then, Sir, he said that there was a considerable obstruction of tidal water in the Narrows. Sir, all I can say to that is, that there has always been a considerable obstruction there; a sort of damming up of the natural channel; but in making this charge he has not shown any state of things worse than existed before. The state of the sands there is constantly shifting, and the hope of Mr. Brooks is, that when his lines are more completely carried out, and his plans and operations are better developed, that which is unfortunately the present condition of the river at that place will be considerably improved. At all events, the charge as it affects my clients really amounts to nothing.

Then he says, that no money was expended except at Newcastle. This is the gentleman who makes that extraordinary charge! Then he says he is greatly in favour of docks, and the next moment he says that he signed a letter to Sir James Graham, to tell him that the Jarrow docks are a most injurious encroachment upon the river! He in one breath says, that he thinks everything should be done for docks, and then he exclaims, no docks for Jarrow! He writes a letter to Sir James Graham, in which he says, "the process of "encroachment by these means, is in rapid progress, and we calculate that with the enormous "encroachment upon Jarrow Slake, contemplated by the York, Newcastle and Berwick "Railway Company, the river Tyne will be found reduced within a few years to three-"fourths of its original area." So that this gentleman, so much in favour, and seeming to pride himself upon his feeling in favour of docks, signed a statement that he regarded the Jarrow docks as an injurious and enormous encroachment upon the river Tyne.

Mr. Seymour.

31st January 1855.

Then the Commissioners will recollect that Mr. Straker had a very strong opinion with reference to Hebburn shoal, and the effect of dredging there. He could not deny that Hebburn shoal had been, and was gone, and that the place where it had been had now deep water over it, through which a ship can pass without any difficulty, and where there was an easy channel. But he says that the dredging has done that. However, on cross-examination by me, Mr. Straker did not maintain his opinion, although he asserted it very stoutly at first, because he afterwards admitted that no dredging had been executed, to his knowledge, after the jetties had been completed.

He said also that half-tide walls when once they attained to the half-tide level, would not rise higher. I think one of the Commissioners put a question to him, as to whether half-tide walls were not deferring the evil, if it existed. It appears to me that that statement is opposed to every principle of the law of gravitation. If you have a half-tide wall, and the water flowing over it, the heavy particles have a tendency to deposit, and no principle seems to me to be more natural, and unless there be some departure from the ordinary course of nature, the result must be, that in spite of the constant flow of the river water there would be a gradual silting up till the half-tide level was overtopped, and the superficial area had got to the full-tide height. However, Mr. Straker has laid down his opinion, and the matter comes to this: what is his opinion worth? One of the Commissioners put the question to Mr. Straker, "Point out any positive injury in the navigable channel," and the injury that Mr. Straker pointed out was a groin immediately above Messrs Leslie's yard, at the east end of Hebburn shoal. Now, Sir, what becomes of that charge? Why, the soundings of Mr. Calver and Mr. Comrie in 1854 prove that where Mr. Straker pointed out the existence of this injury to navigation, there was deep water! That therefore disposes so far as he is concerned, upon the very evidence of Mr. Calver, of this charge of Mr. Straker.

Then he says that the lower part of Shields above the tiers has deteriorated; but on being pressed upon that, he could not give any satisfactory reasons, or point to any particular place where it occurred. Then he hesitated, but the truth came struggling out at last, "I "can mention no other point."

Then he was asked why he had signed a declaration to the effect that there was no system pursued, and his answer was, "Where works are run out for profit, there is no "system in it." I thought his letter to the Admiralty meant that there was no system of engineering. According to Mr. Straker, it appears that works run out "for profit," are those which are without system, as if works might not be at once both profitable and uniform. But Mr. Straker gave us one solution of the lowering of the river bed before he left the chair, which is at all events unique as a specimen of engineering evidence, because he told us that the bed of the river was lowered by a creep in a colliery, and he attributed to that the improvement of a portion of the river Tyne!

The next witness was Mr. Walker Lamb, upon whose peaceful name my friend made a good-natured pun, and all that I can say about him is, that he was rejected by South Shields for having been one of Mr. Stevenson's supporters, I believe, in opposing the Jarrow dock; however, he is a Commissioner no longer; at all events his evidence is not worth any comment from me.

Captain Purdo enters next, upon whom I have made observations before, and his principal charge is, that he found that twenty-two piles were driven by some miraculous means at Messrs. Palmer's works. What these piles were, except piles driven previously to Messrs. Palmer's application, to which we have referred, and prior to our taking office, I do not know. At all events, Captain Purdo's own recollection of the matter did not seem to be very distinct.

Then he complained that the channel required to be deepened for the Sardinian frigate. The Commissioners will recollect that this Sardinian frigate was a splendid 50 gun vessel, and that whereas formerly over the Hebburn shoal there was only 15 feet at high tide, she drew 16 feet, and she was enabled to effect a passage, under the circumstances detailed in evidence before us down the river. It appears to me that a reference to the Sardinian frigate, although for greater caution there was a partial deepening of the channel, does anything but support the views of Captain Purdo.

Then he told us that the bar has very "rarely more than 24 feet water upon it." If Captain Purdo will make that admission, all I can say is, I am very much obliged to him for it; I am content with a 24 feet average. Then he told us that he had made a great many motions, and explained generally the course which he had pursued in the Commission. And here I may observe that at this part of the case, Mr. Pearson, the ruler of the pilots, was brought forward to produce some pilot soundings, in order that reference might be made to them by the Commissioners; and while Mr. Pearson was before the Commissioners he stated that "the bar this year was better than he had ever known it."

Then, Sir, Mr. Poppelwell was called, and Mr. Poppelwell's evidenceas was at first principally directed to the tendency of the works at Willington, to cause the shoaling at Hay Hole. It appears to me to be almost ridiculous calling a witness here to prove the tendency of the works of the former Conservators, done in carrying out Mr. Rennie's plan. At all events, we are not responsible for that; what we did was to make a deviation in detail for the purpose of curing that which a too close adherence to Mr. Rennie's rules had occasioned.

Then, Mr. Poppelwell made this frank admission, he said, "I think the sailing track of

Mr. Seymour.

31st January 1855.

"the navigation is better than before." Here we have admission No. 3. This is the third witness for my learned friend, called to prove that the Tyne has not improved, to prove that we have failed in our duty, to prove that we have abused our trust. He says, "I think the sailing track of the navigation is better than before."

Then Mr. Poppelwell, who is called as an engineering witness, who happens to be a Lloyd's Surveyor at Shields, gives us a pretty clear specimen that he is not a very good land surveyor, for he estimates the land enclosed at an average sum of 1,000*l.* per acre. Lloyd's Surveyors are not necessarily land surveyors; and when we hear of the Dean and Chapter selling a very valuable piece of land at Jarrow, which was in contemplation for docks, and to which the attention of a railway company was directed. at 30*l.* per acre, perhaps we shall be justified in relying upon that practical proof more than upon the opinion of good Mr. Poppelwell, with his land at 1,000*l.* per acre.

Then I said to Mr. Poppelwell, "Upon what do you ground your objection, that there is no system in the operation of the Conservancy?" You will find that Captain Purdo attributes the want of system to a deviation from Mr. Rennie, from whom we say that we have not deviated. Mr. Straker says he means by want of system, that we have done works for profit. Then what is Mr. Poppelwell's definition? Why he says, "There was a dispute "as to the piers, on which I rested my objection that there was no system when I signed "my letter to Sir James Graham." How does that affect the present charge? But there was really no dispute whatever—nothing but universal agreement on the part of the Commissioners, minority and majority, or rather there was on this point no majority and minority, but all was unity and fraternity. Between the Admiralty and the Commissioners there was some little question as to Mr. Walker supervising the plans which Mr. Brooks was to prepare; but the plans were agreed to, and there was universal harmony, which I believe exists at the present moment. All I can say is, that I cannot felicitate my learned friend upon his witnesses in support of his theory that we have acted without system, especially when that charge is directed, not to the piers, or not to the profit, but the question whether or not we have systematically carried out the report of Mr. Rennie and the principles upon which he advised the Corporation to improve this river.

Then he talks of a thing which occurred to me at the time as one of those little circumstances in a case which are of importance, although the importance does not appear at first sight, and it was observed, I think, by more than one of the Commissioners at the time. He said that in 1827 he recollected a vessel drawing 14½ feet went up the river. The observation is plain and evident, that if Mr. Poppelwell can recal the exact draft which this vessel drew and the exact year 27 years ago, and that then it was 14½ feet, it must, in his opinion, have been a very remarkable event; and therefore if we prove that a vessel can go over the same place, drawing 16 feet, I think we have established, as far as Mr. Poppelwell's arguments are concerned, a case against him and in favour of our position that the river has improved and not deteriorated.

Then he tells us that for the last eighteen months there has been a fair average bar, that the last few years the bar has been much the same—that last year it was eight feet, which added to the 16 makes 24. Therefore, so far as that admission of Mr. Poppelwell goes, it supports the admission of Captain Purdo, and appears to me to be a strong confirmation that we have improved the river, and have not spoiled it.

Now, Sir, he says that he grounded twice in 1854 in Bill Reach. Mr. Poppelwell may have been dabbling about the river. I do not know exactly how he was travelling, the craft he was in, or what sort of craft it was. At all events you have the evidence of some facts to lead you to the conclusion that Mr. Poppelwell struck upon a shoal, and that the navigation was impeded by it. But, Sir, what is the fact? Both Mr. Calver and Mr. Comrie have proved that it was impossible, unless a man went purposely to drive imhself out of the navigable channel to meet with any such obstruction in passing that part of the river at Bill Reach. The soundings of Mr. Comrie and Mr. Calver show that there is sufficient depth there for a vessel of the kind which he speaks of to pass. Of course it is for my learned friend hereafter, when he replies, to explain how he can reconcile the soundings of Mr. Calver with the opinion and experience of Mr. Poppelwell.

Sir, at this stage of the proceedings you will recollect that Mr. Straker again presented himself before us, and he gives us the benefit of his thoughts over night. It appears that Mr. Straker, when he has thought over the evidence which he has given, wishes to be recalled. He had told us the day before that the depth of water at Hebburn shoal was occasioned by the dredger, and that the jetties had nothing to do with it, though he gave up that point when pressed; but he comes the next day and has a most beautiful theory, and it would be a pity to pass it by, because I think it ought to be recorded and published to the world, as it may be of use to future engineers in their operations upon the river. He said that he attributed the removal of the shoal at Hebburn to the action of the paddle wheels of the river steamers, and he gave this as an instance. But Mr. Straker admitted to me in cross-examination, a fact which I think he must have forgotten when he started his theory—viz., that he had eight or nine times found himself fixed in a paddle-wheel steamer upon that very shoal some few years ago. The description which he gave seemed to be a ludicrous one, and I could not help thinking that it was something like what I had seen on the coast of Scotland, when some fish of the whale species had got into shallows, and were left by the tide foundering there at low water. It is quite clear

that steamers stuck before in a place where they do not stick now, and therefore it is folly to attribute it to anything but the plain common-sense view of the case, namely, that the jetties, which have been erected there, have directed the current of the river, and have so deepened the channel; a process consistent both with engineering principles and the common-sense view of the subject, and which is also supported by the opinions and the evidence upon which we rely in this case.

Then, Sir, he alters the view which he had given us the day before, as to the want of system, and he says he attributes it to the absence of ascertained river lines. Upon that I will not say much, because he was a party to certain proceedings which show that as far as the question of river lines goes, at all events, Mr. Straker was very ready to give his support to these very river lines.

Sir, he closed his evidence with one fact, which I will just call to your mind. He had been asked the day before to show a single instance wherein works had been inefficiently or injuriously executed upon the river. He could not do it; he went floundering from one place to the other, but when he was asked for his reasons he could not give them. When he asks to be allowed to explain, and when he comes here again, this gentleman, who is put forward as the head and front of the case, and who is brought forward by my learned friend with such a flourish of trumpets, tells you that at Mr. Crawhall's works, three miles above bridge, some props or piles which happened to have been made of rotten timber gave way. That work was done under the old Commissioners, we are not responsible for it. He must have been very much pressed to strain his memory so far as to refer to such a case, and to bring it forward after he had deliberately slept upon it over night, in answer to the question, "Point out where the river has been injured. Show us "where the present Commissioners have failed in improving this stream." He refers us to three miles up the river, to a work for which we are not responsible, which was done by a private individual, and for which even the old Conservators were not responsible, but which while it existed improved the navigation there.

Then Captain Linskill is brought before us. We had a commander in the navy, and now we have a captain in the army, and the two officers seem to marshal their forces with pluck, if not with prudence, to renew the combat with considerable spirit, if not with considerable judgment. Captain Linskill complains sadly about the committee system; and it is a remarkable fact that this complaint comes, of all men in the Commission, from Captain Linskill. I understand it to be a principle as old as the days of Adam Smith, and it is certainly a principle which can never be disputed, that there is nothing so important in carrying out an operation as the division of labour. Upon that principle I presume these committees were appointed. But Captain Linskill's view seems to be to give all the labour to others, and to take none himself. I cannot, therefore, quite understand why he should complain of committees. He has taken no opportunity of acting upon them: and perhaps the gallant Captain feels a sort of sympathy with the other honourable and gallant gentleman, Captain Purdo, who complained of the cost of attending them, and gives him the benefit of his support in condemning these committees. He admitted that he very seldom attended the committees. However, I give him the credit of one thing: that he is a very gentlemanlike and ornamental Commissioner. He is in favour of "strict Government "control." Why he should be in favour of Government control, I do not know; because if he had been a little more attentive to his duties, he would have exercised a little personal control, and therefore, perhaps, he would have had less reason for introducing other influences. But he has given us no reason why that control should be introduced, except that he highly disapproves of the principle upon which this Commission is formed. I have the greatest respect for that gentleman, a gentleman of his profession, and his position as a landowner. Having filled the office which he has of mayor of Tynemouth, and having been elected again by his townsmen to the office, I entertain no other feeling towards him but the greatest possible respect. I have, however, to deal with him as a hostile witness, and I must say that a witness more unworthy of that respect, as far as his evidence goes, I never heard, because he is brought here to support the charge that we have acted without a system, and that these committees are bad, and confesses himself that he has been very much an amateur Commissioner, and has very seldom attended those committees which he now says are injurious in their effects. But, Sir, there was one question put before he left, which question, like that asked of Mr. Straker, got a similar answer. He was asked whether he could point out a single instance of departure from Mr. Brooks' lines. He looked at the map, and he tried awhile, but he failed; he could not point out a single instance in which Mr. Brooks' lines had been departed from. The question was put, I think, as were many other questions of an engineering nature in this Commission which have thrown a great deal of light upon the matter, by Mr. Brunel, and the answer which he got was the one I have stated, namely, "I cannot."

Sir, thus the case so far proceeds, and where is the proof? We have charges enough, and talk enough, and accusation enough, but where is the evidence? Then Mr. Stevenson comes before us, and Mr. Stevenson is a life Commissioner. The very fact of his being in the position of a life Commissioner shows that there must have been, at all events, some reason for making him one. What the opinions of South Shields may be as to their protegé now, I, of course, cannot tell. We have had two South Shields gentlemen here. I cannot believe that Mr. Stevenson, in the course which he has taken, has the approbation of the South Shields people. That is a question for himself, and not for me. However, Mr. Stevenson is called before us, and he begins by referring to Messrs. Palmer's case

Mr. Seymour.

31st January 1855.

as a standing test of our incapacity. I think it is a standing test also of their inability to make out the charge. He told us that Mr. Philipson, who was not then a Commissioner, came before the Commissioners and argued as solicitor for Messrs. Palmer. Mr. Stevenson has told us what Mr. Philipson has upon this point distinctly either contradicted or explained. He then went into the question of his non-success in opposing the licence to fill up Mr. Leslie's little space of ground. I do not want to dwell upon a matter which is an unpleasant thing to Mr. Stevenson, but I cannot help saying that I think that the opposition to giving permission to Mr. Leslie to fill up this piece of ground ought, as a matter of taste, not to have been made by Mr. Stevenson. Either Captain Purdo, or perhaps Captain Linskill, would have been a better party to have brought forward this matter, without Mr. Stevenson placing himself in the very awkward predicament of complaining of a licence being given to do that which he, without leave, had done at Jarrow only a year ago.

Then he talks of the advertisement of the property of Mr. Ellison, which appeared in the papers. I think it only proves this, that Mr. Ellison, as a spirited landowner, seeing a portion of his own property well adapted for extensive manufactories, was anxious to take the means of doing that which it is a most legitimate exercise of his position as a landowner to do, and which is very proper, looking not only to his own interests, but to those of the Tyne, when he placed that advertisement in the paper. It shows no concealment about the matter, and that he was not conscious of the public interests being sacrificed to his own in the operations which were carried out by the Commissioners.

Then Mr. Stevenson handed in numerous reports of Mr. Brooks as instances of Mr. Brooks' want of system, whereas the fact is, that Mr. Brooks has uniformly pursued the course recommended by him in 1843, in his original report and plan, which he sent in to the Corporation, the then Conservators.

Mr. Stevenson has been very unsparing in his attacks upon parties; he imputes motives to Mr. Philipson—then he imputes a motive to the Chairman, and what becomes of the motive? Mr. Philipson is a solicitor, pleading for a client. We are told of secret influence! "Local authority and compliant theories," says Mr. Calver. "Secret influence," "pleading for his client," says Mr. Stevenson. What becomes of the matter? It turns out that Mr. Philipson, not being a Commissioner, is acting only as a friend, and that the "influence" has not been exercised. But here a charge is made by Mr. Stevenson, from which I think the character of the Chairman might have saved him. He makes a charge against Mr. Cowen in his position of Chairman of this Commission, that he had some private interest; he tells us that the dredging machine was sent to do work at Mr. Cowen's, instead of elsewhere. All I can say is, that the proof is notoriously otherwise—the evidence entirely disproves it, because I believe the evidence is, that the dredging machine was not sent to the place to which Mr. Stevenson adverts at all, and has not gone there yet.

Then Mr. Stevenson entered into a long statement as to his reasons for being opposed to transverse jetties. I will spare the Commissioners an analysis of this part of his evidence. I have no doubt Mr. Stevenson is an excellent judge of what is useful in the alkali manufacture, but how that qualifies him to speak upon transverse jetties as opposed to the engineers who are in favour of them, I shall not conjecture, or pause to consider.

He then referred to the notice of the harbour-master, put up to prevent vessels being deeper than a single tier at Hebburn, insinuating that a shoal still existed there. Upon cross-examination, it turned out that the notice was at some place half a mile down the river, where a shoal existed, and there again, like Mr. Straker, he shifted about according as he was giving evidence in chief, or in cross-examination.

Then Mr. Stevenson treated us to another theory—that the effect of the winds upon the silted materials would prevent the half-tide stratum, if I may so call it, growing to the full-tide level. All I can say is, that opinion of Mr. Stevenson is *his* opinion, and we will take it for what it is worth; the opinion of the engineers whom I have called before you and of other engineers is the other way; the Commissioners will put them in the balance, and see which preponderates.

Then Mr. Stevenson goes on to wind up his engineering assertions by saying this, "I consider Mr. Brooks' works a total failure." Now there are degrees in all things; I ask is not that passing all bounds? How can a man, who has an opportunity of comparing the river with what it was before, who sees Hebburn Shoal removed, who sees the improvements made along the river, who sees Killingworth, Jarrow, and other parts of the river so improved, and shoals removed from the places where they existed before, and who sees the navigation freer where there was an impeded navigation before, and sees it in a way that no person can dispute whether it is to be attributed to some fortuitous natural causes, or to the planned operations of Mr. Brooks; how can he say that Mr. Brooks' works are, in his opinion, a total failure. But, however, Sir, he says so, and perhaps the fact that he says so will at all events be some argument in favour of the view which I take, and I do not shrink from my responsibility in expressing it, that Mr. Stevenson having got a very strong opinion into his mind, has allowed himself to be too much influenced by the spirit of the partisan, instead of holding his mind more free from personal bias in the course which he has taken as a Commissioner.

Then, Sir, he complains of the system of depositing ballast at sea not being adopted. Now I have already said that I did not think Mr. Stevenson was in this case the proper person to be the prosecutor, and I did say that I did not think he was the person to throw

Mr. Seymour.

31st January 1855.

stones at us on account of Leslie's encroachment, as it is called, he having done worse and without leave. But if this was improper, I think a fortiori it is so much the worse that Mr. Stevenson should be the principal witness with regard to the heavy expenses of the deposition of ballast. He is in favour of ballast casting at sea being adopted, and when he is pressed as to how it will save the expense, whether it will be cheaper or not to the Commissioners, he really can give no particular reason. He referred, as some other witnesses did, to the Wear, but it turns out that during the winter months nothing is done at the Wear, or scarcely anything, in the seaward deposit of ballast, and also the operation in the Wear, which is just lifting the dredged material and depositing it close by the place from which it is taken, is a very different thing from the navigation in a river like the Tyne, where you cannot deposit these materials within two miles of the bar. However, upon cross-examination, I considered it my duty to put certain questions to him, because when men's characters and public conduct are held up to light, when charges are made against them, it is the duty of Counsel not to shrink from probing motives. I should not be discharging my duty if I did not probe into these matters; not that motives would act so far as to induce a man to deviate wilfully from truth, but they may so poison the feeling and mislead the judgment, that it may induce that which under other circumstances would not be done. We have heard about Jarrow Slake, and we know that under the direction of Mr. Brooks the piles driven without authority by Mr. Stevenson were rooted up and taken away. We know that he was condemned by his brother Commissioners in another instance, which may account for the accusation that they were doing what they did without system. What was his evidence with regard to the system of ballast? I asked him whether he had not joined in a report to the Commissioners that a considerable expense could be saved by depositing ballast at sea, and whether he had not referred to the case of the Wear, and had not reported that in the Wear it could be done for something like 2¼*d.* per ton, and that therefore a very considerable saving could be made in this matter. I then asked him if he had not been present at a meeting of the Committee, when a proposition came before them from his brother, applying for permission to deposit ballast at sea at a charge of 11*d.* Now without following that course, which I shall not refer to any further, without attributing a particular motive or supposing that the question of depositing ballast at sea is at all connected with the question of his brother's profit, at all events this observation is to be made. He says, "You act injudiciously, you act extravagantly, you the Commissioners can deposit your "ballast cheaper at sea, at the Wear they do it for 2¼*d.*" But when pressed he says, "My "brother made a proposition, and I sanctioned it, to do it for 11*d.*" Where then is the saving to the Commissioners? All I say about it is, that whatever view you take, whether you think he is acting from a feeling of good faith or not, this fact is plain, that Mr. Stevenson himself approved of a price very much above that in the Wear, which he refers to as an illustration; at all events I think it disposes of the effect of his evidence upon that head.

Then Mr. Stevenson insisted a good deal that there were many questions in dispute between the Corporation and the Commissioners. Sir, there is no question in dispute; coal dues have been referred to, but they are apportioned and settled by the Act of Parliament. They are not questions which can arise before the Commissioners, and they ought not to be attempted to be mixed up with this case for the purpose of showing the Commissioners are so trammelled by their connexion with the Corporation, that they cannot discharge their duties without an improper bias.

Mr. Stevenson then gave us his opinion that there should be a Court of Appeal to settle disputes. All I can say is, that if a Court of Appeal is established, it will not put an end to minorities; it will not silence Captain Purdo; if Captain Purdo has a strong opinion, and if, notwithstanding, a decision is come to by majority after majority, he will persist in his motions until he drives many of those acting with him to pronounce his opposition factious, and to declare like one of his supporters whom we called, that they cannot approve of such conduct. If that is the course pursued, no Court of Appeal can ever prevent those "scenes," as Mr. Stevenson calls them, (he, who was the chief 'actor' in them!) which I am sorry to hear a portion of the minority have caused in the council room of the Commissioners.

He said, in answer to a question which was put to two or three of the witnesses by the Chairman, that the improvement of the river was retarded by the disputes between Newcastle and Shields. He gave his opinion that the best way to get rid of that would be "to put an end to the cause." It seems to me that the great dispute, as far as Mr. Stevenson is concerned, has been referable to his strong opinions against Mr. Brooks' engineering works; but if no case is made out against the principle upon which Mr. Brooks proceeds, those works ought to have a fair trial. I do not see where the bone of contention will be after that. It appears to me that the Commissioners may have it in their power upon this evidence to meet Mr. Stevenson upon that point, and to say, "The cause of dispute is removed; we will let the works have a further trial."

Sir, I have already commented upon Mr. Stevenson's observations with regard to Mr. Brooks' plan, and his saying that this was the first time he had seen the plan at one view. No doubt that is another illustration of the feeling which exists on the part of Mr. Stevenson. "Any one but Brooks," ejaculates Mr. Stevenson! "Even the Devil," interposes Mr. Straker!

Then Mr. Stevenson mentioned that compensation for injury, suggested to be caused by the half-tide walls, could be given by viaducts with piles. I did not ask Mr. Stevenson,

Mr. Seymour.

31st January 1855.

but it does appear to me that if he had applied that principle of viaducts to his own four or five acres at Jarrow, he would have found a very great difficulty in it.

The next witness called was Mr. Danson, I may say from out of our own camp, for he is brought by the minority against the majority, and is placed in not a very pleasing position. He gives his evidence, and without pausing too much upon his testimony, he makes one admission, which I shall set side by side with Mr. Stevenson's assertion that Mr. Brooks' operations have been a total failure; he says that "the mid-channel, taking it as a whole, is "generally deeper."

Now, Sir, the case for my learned friend, as far as it was *his* case, technically speaking, ended there; but the Commissioners, whose only desire is to have light thrown upon this matter, by the fullest evidence, allowed Mr. Calver to be examined by him, and called him as one of the witnesses summoned by the Commissioners. Mr. Calver came into the box, and there is one observation which I think I am entitled to make. Mr. Calver gave us a great many statements, to a few of which I shall now refer, based upon a comparison between 1813 and 1849. Suppose we admit that everything is as it appears upon his calculations, does it follow that that is evidence against us? We are put upon our defence of what we have done since 1850 as Commissioners; the great bulk of Mr. Calver's calculations are based upon a comparison between 1813 and 1849. An analysis of his views upon that matter will, I think, show that the Commissioners have nothing to fear from him, but taking them as Mr Calver would put them, it appears to me that we should not be called upon to enter into that matter, but that the fairest course would be to take a comparison of 1850 and 1854. He says that in 1849 the loss upon the spring tide as compared with Mr. Rennie's estimate at high water was 34,261,000 cubic feet. I asked Mr. Calver several questions upon this matter, in order to ascertain the principle upon which he arrived at that conclusion. I had read the reply of Mr. Brooks to this charge, because it is an old charge of Mr. Calver, and is contained in evidence, which Mr. Calver has given upon previous occasions. I asked him whether he had not assumed, in the course of his calculations, that the tidal receptacle was filled at the same instant of time at Newcastle and at the bar. I called his attention to the following passage in Mr. Brooks' letter: "I have as yet "only given his errors above the surface of the river at the instant of high water on the "bar, and have now to call your attention to the fact that he has fallen into another heavy "mistake, also involving an error of other scores of millions of cubic feet, by calculating "his contents of tidal water from the level of low water at each station when the river is "at its lowest state. This can only be correct on the bar, because at every other station, "the time of low water is later than on the bar. Thus at the instant of first of flood on "the bar on the 15th of September 1848, when the water stood at 16 feet 9½ inches "below datum, it was 8 feet 9 below datum at Newcastle, 7 feet 3 at Elswick, 5 feet 9 at "Stella, and 3 feet 11 below datum at Newburn." Then he goes on, "In calculating the "cubical contents of this tide of the 15th, according to Mr. Calver's erroneous mode, he "would for the Newcastle height have taken the actual rise and fall on that day of 11 feet "3 inches, in lieu of deducting from that height 2 feet for the part not filled at the instant "of high water on the bar, and 3 feet not emptied at the instant of first of flood on the "bar; or for one of his data he would have taken 11 feet 3 inches in lieu of 6 feet "3 inches. In this way his calculations were made." I asked Mr. Calver this question, to obtain an explanation upon this matter; because it appeared to me, that if by the contraction of the channel the tide ebbs out lower, he ought to give us the benefit of the additional quantity of water resulting from the reduced level, and if he omits doing so he falls into a fallacy. Upon the same erroneous process he exaggerates the quantity of tidal water thrown into the receptacle, by assuming that the tidal basin is filled at the same instant of time, and upon this assumption he makes a mistake of many millions of cubic feet in his calculations. He said that he had made no error of the sort; but on looking to the evidence which was given by Mr. Calver upon a previous examination in 1849, I find he used the like expression as he has here used. He took the 15 feet dead level of Mr. Rennie through the river to refer the bed of the river of 1849 to; Mr. Brooks asserts positively, and it was contended throughout, in my cross-examination of Mr. Calver, that this calculation of Mr. Calver is based upon a false assumption, and in that he is supported by something which fell from Mr. Taylor. I think at all events one witness called by me stated that Mr. Rennie had based his calculations upon the assumption of the tidal receptacle being filled throughout. If that be so the argument of Mr. Brooks and my argument is correct, and great caution must be taken in dealing with the evidence of Mr. Calver.

Then Mr. Calver says that he found a mean loss of eight inches on the deepest tract of the river, comparing it in 1813 and 1849. There is no doubt that as by taking deep holes and making an average you can arrive at a flattering conclusion, so by taking shallow places and making an average you can arrive at a hostile conclusion, where it is necessary to take a different view; but it appears that his mean loss is scarcely a test, unless we know the exact principle upon which it is ascertained. At all events he admits that the available navigable depth had increased a foot. If that be so it is a very important admission.

He also states that in 1813 a vessel drawing four feet water could proceed from Shields Narrows 28,000 feet without interruption, but that in 1849 the same vessel would be interrupted in the lower part of Jarrow Slake at one half the former distance. It has been proved distinctly in this case, that in 1813 there was an interruption to the navigation by

Mr. Seymour.

31st January 1855.

Howdon Shoal, which is near the Jarrow Slake; therefore a vessel interrupted at Howdon Shoal would be interrupted just at the same distance where, according to Mr. Calver, upon the comparison between 1813 and 1849, a vessel would be then interrupted. And here is a proof of what I said before, it is an illustration of the fallacy and the unfairness of calling upon us to answer for that which existed in 1849. As a matter of fact, in 1849 there was a shoal at Jarrow Slake, caused by the channel of the river crossing from the north to the south shore, upon which we had very distinct evidence, but now by Mr. Calver's own soundings there are five feet three inches at that place. Putting these facts as against the statement of Mr. Calver, it does appear to me that his evidence on the whole upon that point cannot be looked upon as assisting the case alleged by my learned friend against the Commissioners.

Then he says that, taking the sands dry at low water at Jarrow Slake, they gave 104 acres in 1849, and 99 in 1813, so that there was an increase of five acres; but he does not say that those sands exist now, and I presume that that is the whole question, as far as I am concerned.

Then Mr. Calver says that he compared the low-water area in Mr. Rennie's time, and in 1849, that he calculated the sections, but that he is not yet prepared with the digest. Therefore in his calculation as to the low-water area, we have no means of ascertaining the principle upon which he has done it; and upon a matter which is of the utmost importance to us, namely the condition of the low-water area, Mr. Calver has really given us practically no information.

Then he says that between 1813 and 1849, the gorge, as he calls it, of the navigable channel decreased from 30 to 40 per cent. He was asked by an honourable Commissioner whether, with the diminution of the breadth, the sectional capacity had diminished; and his answer was, that he had made no calculation. What becomes, then, of the charge? He admits, however, that the depth of water at the bar was greater than in Mr. Rennie's time, and was now approaching to that which he says was the original depth, taking the average upon old soundings. That is an admission in my favour, and coming from Mr. Calver, with the opinions he entertains, it seems to me to be one of considerable importance.

Now with regard to the sectional capacity of the sailing channel, as he expresses himself, of the bar, he says that there is a decrease from 9,775 square feet to 7,560. The Commissioners will recollect that I asked Mr. Calver several questions here. He had given previous evidence upon this very same point, and he had not then used the expression "sailing "channel." I asked him whether he referred, when he spoke of this calculation, to the discharge of water at the bar, and the capacity of discharge, or the capacity of the sailing channel, strictly so called. Mr. Calver said, that upon both occasions he referred to the capacity of the sailing channel. However, when we came to estimate it, we found that he had not allowed for the distance between the Spar Hawk and the shore. If he had allowed that, taking the sectional capacity of the whole, including that space, it would clearly get rid of his evidence upon that point.

At this part of the case there was a diagram of Mr. Brooks', to which Mr. Calver referred, which had been before the Admiralty, where 24 feet was marked as shown at the bar; and he called your attention to the fact that the Admiralty Survey only allowed 21 feet 8. Mr. Calver wished for the production of the pilot book; the pilot book was accordingly produced, and the Commissioners will recollect that on the 12th of June it gave 7 feet at low water, which was equal to 23 feet at the bar. There were variations pointed out by the learned Recorder for Manchester to a considerable extent, running from 20 to 24 feet, but at all events the evidence, as far as that book was concerned, rather strengthened the statement of Mr. Brooks than conflicted with it.

Sir, the Commissioners will recollect Mr. Calver being recalled; and it may be important here that I should conclude with my observations upon his evidence. The Commissioners will recollect that the plan which has been on the wall during the course of these examinations showed in two several places a very large figure of 3 feet, and a small one of 9 inches in one case, and a small figure of 10 inches in the other. I confess that though I have not got the worst eyes, I did not distinguish either the 10 or the 9; the 10, Sir, is very nearly a foot, and so is the 9. It was, perhaps, an oversight that it should have so appeared upon the map; but when Mr. Calver was recalled, and asked to explain the soundings which he had given in, he could not explain why he had fixed upon the depth at a place which he had pointed out of only 3 feet 10. His explanation was, that he had afterwards filled in soundings taken in that direction, and that he had thus arrived at that result; but at all events, when pressed, he could not account for the fact that in the channel, as appears by the soundings taken by himself as well as by Mr. Comrie, there were 5 feet 3, where he had marked 3 feet 10. Sir, I do not want to say anything depreciatory regarding Mr. Calver; but I think it unfortunate that, considering his position as a public officer, he should have committed such a mistake. He saw the importance which I attached to it; he saw the importance which Mr. Brooks attached to it; he saw the importance of this inquiry as to the existence of a shoal there; and it certainly appears to me a very unfortunate thing that such a piece of evidence came out, and that when he was recalled, and an opportunity given to him of explaining the matter, he made it worse for himself, so far as his evidence against Mr. Brooks is concerned.

Sir, before I have done with Mr. Calver, I would just refer once more to his letter to the Admiralty, to which I have already called the attention of the Commissioners, and I

Mr. Seymour.

31st January 1855.

shall make one observation upon that letter. There is a map which accompanied the report of Mr. Calver to the Admiralty; the map is dated 17th December 1853. Now I find upon that map, which is sent as a guide to the Admiralty, to explain the report of Mr. Calver upon the condition of the river, that Walker Sand is most prominently given Hebburn Shoal most distinctly marked, and also a portion of Jarrow bank, near the Muckhouse, and another sand further down the river. According to the evidence of every witness who has been examined at the time that this map bears date, and at the time that it was received by the Admiralty, those shoals did not exist. It may be an accident, but it would have been better if it had not occurred, because it is calculated to mislead. It is quite clear that upon the map itself there are marks showing the jetties at Hebburn Quay. Now the witnesses for the minority have admitted that simultaneously with the construction of those jetties was the removal of Hebburn Shoal; but here we have the jetties and Hebburn Shoal upon the map existing together; and also we have Walker Sand, which the other adverse witnesses admitted had been removed at that time. Something has been said about the Clyde not being an analogous river. In that report Mr. Calver calls the attention of the Admiralty to the condition of the Clyde, as "affording some important observations with reference to the condition of the Tyne."

Sir, that was, in fact, one may say, the conclusion of Mr. Calver's testimony, and I shall not, after the observations which I have made, address any further remarks upon it. I will only say that I was entitled to make the observations which I have been making. I regret that he should have given me occasion to do so; but as far as Mr. Brooks is concerned, I am very glad that the opportunity was afforded of showing that even in Mr. Calver's case, the latter may have been misled by a strong opinion to the conclusion which he has formed, and at all events, that his own soundings give a result which is favourable to our view of the case, and unfavourable to the charge against the Commissioners. As I said before, one does not like commenting upon matters which touch personal position, or anything of that description. I observe, however, a curious thing in the report to the Admiralty by Mr. Calver. He says, as the recommendation with which he winds up to the Admiralty,—"Lastly, that the Tyne, with the other northern ports, from Whitby to Blyth inclusive, be "placed under an acting conservator, and be subjected to the strictest periodical super-"vision." He gives us rather a graphic description now, —"Such party (responsible to "their Lordships only) should walk the boundaries, plan in hand, whereby encroachments "or other abuses would become immediately apparent." Now I certainly observed a remarkable passage in Mr. Calver's evidence in 1850, when he puts the case of what he would or would not do, were *he* appointed the Conservator of the Tyne; whether Mr. Calver would "walk the boundaries, map in hand," if he got such an important office, he best knows himself. Whether the picture of Mr. Calver thus engaged was before him when he gave his evidence to day, he also best knows himself!

Sir, such is the case as made by my learned friend. In the course of it he referred (it was not opened in his own general charge against us) to White Hill Point; and he made the charge of not cutting off that part of the river. As to that, he called no witness—he has given us no evidence, he has left his case incomplete. As to Bill Point, he said that he would bring forward evidence with regard to it, but he has also closed his case without giving any evidence whatever upon the matter, and left it, in fact, as a mere assertion without proof. Sir, as far as my learned friend's case is concerned, therefore, I have disposed of it. Now, were we before another tribunal, I confess, I do not think I should be acting in a manner to subject myself to an imputation of ignorance, either of law or of legal practice, if I submitted that there ought to be a non-suit. I submit, Sir, that the plaintiffs in this case should be non-suited. The issue is, has the Tyne Commission failed? Have the Commissioners, or have they not, improved the navigation of the river? Are they, or are they not, proved wanting in their trust? The proof is all the other way. Not only is there no proof of any absence of attention to their duties, not only is there no proof of deterioration of the channel of the river, the interests of the man or of the Corporation going against the interest of the river, the interest of Newcastle predominating over that of Shields, but the proof is all the other way; and upon my learned friend's own evidence, without going to the substantive case which I have set up in answer to it, I do submit with great confidence to this Commission, that my learned friend has not made out his charges, and that so far as the Improvement Commissioners are concerned, his case has failed altogether. He said something about the mode of expending their money, something about the cost of ballast, and other charges of that kind, to which I have referred in passing. But all these charges are either disproved or he has offered no proof at all in their substantiation.

Now, Sir, I shall as shortly as I can call the attention of the Commissioners to the evidence given by us: it was given very lately, it is very fully before your minds; and recollecting the time I have already occupied, which I confess exceeds that which I had at all anticipated, I shall proceed to call your attention briefly to the evidence which was laid by me before you on behalf of the Commissioners. The first thing which they did in answer to the charge, was to put in the plan of Mr. Comrie, and this is what they say with regard to it. There were clear and strict instructions given by Mr. Clayton to Mr. Comrie, in which he stated that Mr. Comrie should go and take his sounding instruments, that he should sound at each point where he had made soundings in 1813 and 1849. Therefore, the map before you is one which will enable the Commissioners to arrive at a very clear and satisfactory conclusion as comparing those portions of time.

Mr. Seymour.

31st January 1855.

Now Mr. Brooks gave his evidence before the Commission in a manner which relieved me from questioning him, because it was suggested by the Chairman that he had better give his evidence in a narrative form, and certainly, as the narrative was given by Mr. Brooks, it appeared to me those facts which he stated demolished step by step the superstructure which had been raised against the Commissioners and himself by Mr. Webster, and that he established a case which, if strong before, upon Mr. Webster's own witnesses, was stronger than ever, and rendered in fact impregnable by the evidence given by Mr. Brooks. He pointed out that on the earliest charts by Fryer, shoals were shown existing in Tyne Main, Ellison Main, St. Anthony's, Hebburn, Killingworth, Howdon, and Jarrow. In Shields harbour, there were the Droitwich Sands from the north to the south shore, which had a great effect in contracting the navigation. Then on the south shore lower down there were the Insand and the Middle Ground, extending from the south to the north, which also contracted the navigation, leaving the navigable passage only 180 feet between the point of the Middle Ground and the Low Light shore. He also stated that the early charts of the bar prove that the general depth at high-water spring tides was 21 feet, while others between Collins and Rennie or Giles' Survey in 1813, as for instance, the original manuscript chart of Fryer, gave 22 feet. The soundings on the bar in that day show the low-water mark at 7 feet. A portion of this survey, which has been referred to as having been engraved, gave a depth of 8 feet, but the Commissioners will look rather to the original manuscript, which gives only 7 feet. In 1813, a survey was made by order of the Corporation, by Messrs. Giles and Comrie, of the whole river below bridge. That survey very prominently shows Ellison Main, Hebburn and Howden shoals, and the main channel at that time running through Hay Hole; the southern channel below Jarrow being at that time quite a maze of sands, and as appears from Mr. Brooks' testimony, only passable at a high state of tide for a very light craft indeed. Shields harbour resembles the description given in the former survey. The bar has only 21 feet at high water, but is shoaler in two different portions.

It appears in Mr. Clayton's evidence, and was confirmed by Mr. Brooks, that shortly after the Reform Bill the Corporation (whether they had an infusion of new blood I do not know) made resolute efforts to improve the navigation, taking as the basis of their operations Mr. Rennie's lines. Some difficulties were at first encountered with the landowners, but the Corporation commenced by setting a good example on their own estates at Walker and Willington. The effect of that course was that at Walker a partial contraction of the navigation was effected. At Willington they got into difficulties by an attempt to carry out Mr. Rennie's plan, to which I have already referred. The works at Willington caused a deposition of sand, which blocked the passage, and would have filled up the coal staiths, which are such an important interest there: and I am very properly reminded of Hay Hole being a bay which Mr. Rennie intended to stop up. Therefore this would have been the legitimate result of the works carried on in conformity with the suggestion originally made by Mr. Rennie. About this time Mr. Brooks makes his appearance upon the scene as the engineer to the Corporation, in the room of Mr. Anderson, who had died, and the first thing which he did was to write the report of 1843, which is before the Commissioners, with a very elaborate map, in which he proposed a deviation in Hay Hole. He adduces the present deviation from Mr. Rennie, which has been since carried out at Hay Hole, and shows a plan how to realize the improvements of Mr. Rennie without making the navigation or the properties in Hay Hole Bight suffer from the consequences with which they were menaced from a too strict adherence to Mr. Rennie's original plan. He found it necessary to change the west end of the quay line at Willington, and to construct some works in Jarrow Bight, the united effect of which was, as he clearly showed, a partial restoration of the current of ebb down the Hay Hole Channel, and therefore, in fact, a partial restoration of the condition in which the Hay Hole channel was before the works of Mr. Rennie led to the result to which I have referred. The shoals which had blocked up the navigation were swept away at the west end of the channel. The necessary result of this was, that the deep water on the Jarrow shore became shoaler as the channel through Hay Hole became deeper. We have heard an expression of Mr. Rennie, which is at the commencement of his report, that "great "width is incompatible with great depth;" and that appears to have been the case here, for we have Mr. Brooks stating that he found a great depth on both sides incompatible with great width from shore to shore: new works were then forming land abreast of Jarrow Bight, which was raised to within four feet of the high-water level, and those works were near the place of Messrs. Palmer's application; in fact, what we are now speaking of is the site of Messrs. Palmer's application, and therefore it throws light upon the connexion between the original following out of Mr. Rennie's plan and the subsequent condition of the river, the deviation of Mr. Brooks, and the application of Messrs. Palmer, and the reasons why the Conservators agreed to that application. Many other works were done between 1843 and 1848, by Mr. Brooks, from St. Anthony's Reach down to the Jarrow quay, the effect of which he states to be to give a general depth of five feet at low water, where shoals once existed having only two to three feet, and where formerly the smallest steam craft grounded.

Now, Sir, I have taken down a very careful note, and it has also been done by others, of the various comparative estimates which have been given in, but I only intend to call your attention to one estimate, which for the purposes of my observation will illustrate my

Mr. Seymour.

31st January 1855.

view of the case. I will take the soundings of 1813 as compared with Mr. Comrie's of 1854, and will make a few observations; the result I find is as follows. Comparing the state of the bed as included between the lines of Mr. Rennie and Mr. Brooks, which are very much alike, the same soundings give, according to Mr. Ure, 2,500,000 cubic yards of sand, as removed out of the new channel by the scouring action of the current. Now there is an independent witness, who comes here to ascertain the truth, and to acquaint himself for his own satisfaction as an engineer with the actual condition of the river. He takes the soundings of Mr. Comrie, he takes the soundings of Mr. Rennie, and this is the result, that there has been a removal of 2,500,000 cubic yards of sand out of the channel by the scouring action of the current. That is a very strong proof of the effect upon the channel of the operations of Mr. Brooks. Then as to the bar—in 1813 the sectional capacity of the bar or area of discharge of the Tyne waters, as limited between the banks on each side, having a depth of 3 feet at low water, amounted to 10,567 square feet. In 1854, at the same points, it was 12,049 feet. Therefore there is a favourable difference there between the sectional capacity of the bar in 1813, and the sectional capacity of the bar in 1854. Then as to the navigable track over the bar in 1813, the utmost available depth was 21 feet. In 1854, according to Mr. Comrie's survey, it may be taken at 22 feet 3 inches. As another test of the channel over the bar, in 1813 there existed a width of 1,050 feet, with a general depth of 6 feet, with two interruptions of 5 feet 6 inches. In 1854 there was a width of 1,100 feet, of which 125 feet averaged 7 feet 1; 430 averaged 6 feet 11; 210 averaged 6 feet 5; and 218 averaged 6 feet 3; giving a width of 983 feet, of which more than half has 7 feet at low water. It appears to me that those calculations are decisive in favour of the argument which I have been addressing to the Commissioners, the intermediate surveys made in 1838 and 1849, both producing a better result than that of 1813, but neither of them coming up to that of 1854.

Sir, in corroboration of this, I called before you the Shields harbour-master. I called before you several pilots, who spoke of the ships which they brought up, and other witnesses. My learned friend called no pilots; he made a flourish that he would call a hundred pilots if I wished it, but I challenged him to call one. Of course he is responsible for his own case; he is the best judge why he did not call them. I called river pilots and sea pilots; all corroborate the result arrived at by the more scientific calculations of Mr. Ure and Mr. Brooks, namely, that there is a great improvement in the navigable channel of the river from one end to the other.

Then you will recollect the evidence of Mr. Taylor, who spoke of the governing power of the Tyne being land floods, and Mr. Taylor's evidence also with regard to the influence of freshes upon the river the Commissioners will remember; it is not necessary for me very particularly to dwell upon it. But I will ask permission, instead of that, as a book has been given in evidence containing a letter which Mr. Taylor wrote, to refer the Commissioners to the following passage, at page 8 of the reply of Mr. Taylor to the letter of Mr. Calver, and which reply is dated, "Newcastle, 5th February "1852.—I am not at all disposed to demur to the conclusion that benefit has arisen from "the erection of low training walls, viewing such structures as being, though imperfect, "still an advance in the right direction, just as there must be half tidal walls, before there "can be full tidal ones. But I feel compelled, upon the grounds explained both here and "in former investigations, to retain my opinion, that what may be termed the completion "of the design is necessary in order to realize all the beneficial results. Indeed, regarding "the tidal basin as a whole, it surely implies a contradiction to aim at lowering the bed as "the prime object of river engineering, and at the same time to intercept the body of "water, whose agency ought, under better regulation, to assist so materially in effecting "that depression. Putting the case for a moment in another aspect, and assuming half "tidal walls to be constructed in the first instance, it is not difficult to perceive that they "would ultimately be made into full tidal ones, a line of proceeding to which, indepently of "other reasons, the depositions taking place within them would point out the way. It "cannot surely be supposed that those squalid receptacles of accumulating mud would be "allowed to continue ad infinitum. Their consummation is to be converted into useful and "valuable land, possessing deep-water frontage, and occupied, to a great extent, by manu-"factories; results which it is to be hoped may prove a source of future consolation to "Mr. Calver, should that gentleman survive the patriotic crisis of his anxiety for the "safety of the Tyne."

Now, Sir, there is really the opinion of Mr. Taylor, where it can be read, where it is given with perhaps more distinctness and clearness than that which can be gathered from his evidence as given here; and it shows, coming as it does from one of the most eminent practical authorities in the North of England, that he takes a view of the case entirely corroborative of the views of Mr. Brooks. I am reminded that he is one of the very few men who have written upon the subject of the improvement of tidal navigations.

Sir, I also called Mr. Ure before you. That is another instance in which I did not shrink from calling parties directly connected with the question at issue. Mr. Ure appears to have been formerly the principal assistant of Mr. Rendel. Whatever Mr. Rendel's view may have been, he comes here without any feeling whatever, it being the wish, I believe, of both parties that he should give his views of the state of things uopn the Clyde. He gives us an extraordinary illustration of the effect of the works there upon the same principle that is pursued here, namely, of transverse jetties and full-tide walls. He says that

formerly craft of 3 feet draught could only get up at the highest tides, and that now ships of something like 2,400 tons can get up the same channel. He attributes that result very much to the influence of full tidal walls. He says that that influence operates along with other influences affecting the river by the tide passing up it, but he attributes the primary influence to the operations on the banks of the river, by contracting the superficial area of the stream, and confining the energy of the water to the channel of the bed of the river. He says that he approves highly both of the works themselves, the principle, and also the order of the works taken upon the Tyne; and he gave several calculations to the Commissioners, which I only do not refer to now because, as the plans are before them, and they expressed a wish, I think, that sections should be taken in different portions of the comparative plans, it would be taking up the time of the Commission unnecessarily were I to give them the calculations to which Mr. Ure referred. I will only say that the conclusions to which he came prove that Mr. Calver was wrong in the estimate which he made as to the 3 feet 10 and 3 feet 9 upon his map; and he disposes altogether of the opinion of Mr. Stevenson of the total failure of Mr. Brooks' works, by showing, from the comparative estimates which he made, and the conclusion at which he arrived from his own soundings, that the condition of the Tyne, upon his examination only a few days ago, was an immense improvement upon the condition of the Tyne, either in 1849, or still more in 1813.

Then, Sir, I called Mr. Dunn, the wharfinger, before you, and he spoke to a larger class of vessels coming up to Newcastle; and Mr. Dunn is exactly one of these gentlemen who feel that identity of interest with Shields which Newcastle has in larger vessels coming over the bar and up the Tyne. From the very mode in which he referred to the subject, he seemed as if he liked to dwell upon it. You have the fact, that simultaneously with the works now going on upon the river, vessels of larger draught and burthen were discharging their cargoes at the quays of Newcastle. He told me one fact, which struck me as a fact of great value. He says, that he has made observations upon the increase of the flow of the tide, and the reduction of the low-water surface consequent upon the removal of the shoals; and he gives something which he remarked from time to time, and which is certainly adding a very valuable piece of evidence in the case, namely, that the coffer-dam piles, which are round the piers of the High-level Bridge, were previously under water, and required a machine to cut them away; but that now they can get at them without requiring a machine, because they are visible from 12 to 18 inches, or bare at low water. Sir, as a man myself who, I may say, was quite a novice in river engineering, at all events until I came here six days ago, that seems to me worth all the ingenious theories which may be quoted on one side or the other, or all the extracts which may be written. Mr. Brooks says, "My object is to increase the capacity of the river. I wish to see the "low-water surface reduced, so that a more powerful tidal column may be received in "its receptacle, and that thus the scouring action of the water and the velocity of the "river may be increased." He says, "That is done;" he gives you soundings to prove it; and I have called before you this gentleman who gives you this extraordinary instance, to which his attention has been called, and which I accept in corroboration of the view of Mr. Brooks. I believe it has been already stated that tidal observations have been recently taken, which were spoken of this morning, by Mr. Stevenson, which can be handed in to the Commissioners, and which I undertake to say entirely support what has been alleged by me and proved by Mr. Dunn.

Then, Sir, Mr. Clayton was called, and he gave his evidence so distinctly and clearly upon the whole question, the history of the conduct of the Corporation previously, and of the present Conservators, that I do not think it necessary for me now to go into detail upon it; it is before you. It is entirely corroborative of the other evidence. Upon engineering questions he did not profess to give us information; but still he spoke upon the Tyne Main Shoal, and other matters which he is old enough to remember, and as to which he is young enough also to give us the benefit of his experience, and he has stated the great benefit which the river has derived from the operations along its banks. There were also some minutes produced by Mr. Clayton, one or two of considerable importance, to which I will ask the Commissioners in passing to direct their attention; they are on the shorthand writer's notes. By those minutes we find that Mr. Straker and others, who are now so loud about the departure from lines, themselves revised these lines, and adopted them, let Mr. Stevenson say what he likes. There are the minutes. If he has not made a motion, looking to his history in connexion with this Commission, all I can say is, that I apprehend that it is the best possible proof that he had no ground to make it upon. My learned friend, Mr. Webster interposed with a little ingenuity; he asked, "If Mr. Stevenson was there, "may he not have objected without dividing?" To be sure he may have objected without dividing; but if he had thought that there was anything in his objection, he would have divided; and judging of the character of the man by the results which we have seen in those pages, I appeal to them as evidence against the theories of Mr. Webster, or any suggestion which may be now made.

Then, Sir, Mr. Cowen, the respected chairman of the Tyne Improvement Commissioners, was called before us. He explained to the Commissioners the course which had always guided him, and he particularly dwelt upon the facilities always afforded to any person who wished to get information, and the invitation which he had to the best information which it was in their power to bestow. He dwelt upon his desire that harmony should be restored, and his own efforts to carry out that harmony as far as his example

Mr. Seymour.

31st January 1855.

could do it. He also answered the charge which seemed to have come in the course of this case, although it had not been made by my learned friend, Mr. Webster, as to the depositing of ballast along the river, and some heaps which had been seen, I think, by the sharp eye of Mr. Brunel in his passage down the river. As to that, he has handed in to-day notices which were published and circulated, warning people that they would be pursued with penalties if they persisted in that course. He has told you that he instructed his own workmen to do everything in their power to prevent these accumulations; and, therefore, not only by his silent working indoors, but out of doors, he has endeavoured conscientiously to perform the task committed to him. There was one circumstance to which Mr. Cowen alluded, and, with the sensitiveness of a gentleman and a man of feeling, I am really not surprised at his alluding to it. We have had letters put in. We have had the letter to Sir James Graham of the 3d of June, and the reply, in which there are a few strong terms used; but they are not objectionable terms. They are really terms which, I should say, are only what would have been dictated by the circumstances of the case. Mr. Cowen tells us a circumstance, which I may refer to, that on the 15th of June there was a meeting upon which he dwelt as one of the happiest days that had ever been seen upon the banks of the Tyne, when harmony reigned around; when they were all allied together on laying the foundation stone of the piers, he hoping, as he said, that it would be laying the foundation of peace and mutual confidence; whereas it appears that those who now accuse us had not the candour or the good taste to tell their brother co-trustees, sharing the happiness of the hour with them, that they had a few days before written that letter which has been produced here, containing those monstrous charges as to their abuse of their trust, which, I say, upon this evidence, are the grossest libels which can be uttered upon the character of public men. I think Mr. Cowen was entitled to state that fact to the Commissioners. It is a fact which, without making observations as to the motives for the conduct of individuals, may be put with the other facts in this case as affording, perhaps, some proof that there is, from some cause or other, against whomsoever directed, or from whatever source it springs, an unfortunate feeling in the breast of some few of the Commissioners, which really, I believe, lies at the foundation of all the want of harmony which has occurred, and all the accusation which is now made against the majority of the Commissioners.

Mr. Allhusen was called, and I shall dispose of his evidence as shortly as of the others. Mr. Allhusen is a gentleman of great respectability, and although we have called no gallant captain or no naval officer, although we have not called either a Mr. Poppelwell or a Mr. Lamb, I must say that we have called before the Commissioners gentlemen, and they have seen them sitting in the chair before them, of whose intelligence, and of whose knowledge, and of whose independence they, of course, will best form their own opinion. I will merely ask them to recollect, when they come to measure the testimony, who the men are that give the evidence. Mr. Allhusen mentions his anxious efforts (and here again he supports the chairman) always to bring about harmony. That seems to have been their anxious desire; and he says, that on the 23d of May 1853, the following document was drawn up. "The Commissioners having considered the plan of the Tyne between Hebburn Quay and Newcastle, are of opinion that the following operations might be "advantageously executed as soon as funds will permit." You will recollect what was said about bit-by-bit works, there seems to be here an admission that the funds were not sufficient altogether to the work. "To carry out, as rapidly as possible, the resolution of the "Commissioners to carry a half-tide wall along Cockcrow Sand on Mr. Brooks' line, from "the stone jetty at Hebburn Staith to the upper wooden jetty at Hebburn Quay. To "deepen the under-water shelf of rock at Bill Point to a depth of 7 feet under low "water, as far back as Mr. Brooks' line, but keeping in view at a future time a much "larger diminution of the point. To quay in the bight opposite St. Anthony's Point, and "to cut off 60 feet from the projecting corner opposite to St. Anthony's Chemical Works. "To cut off the land at Felling Staiths, as far inwards as Mr. Brooks' line. To cut off "66 feet, if possible, from Friar's Goose Point. To build a quay between Friar's Goose "works and Mr. Allhusen's works.—Approved." And the first name upon the list is "James C. Stevenson." Mr. James C. Stevenson now repudiates this document, or says that it was a dead letter, or something of that kind; and Mr. Allhusen adds, that he, having signed that document in 1853 as a first offering in favour of peace, afterwards stated that there was no possibility of going on as long as Mr. Brooks was the engineer of the Conservators.

Sir, then I called Mr. Mather, one of the South Shields Commissioners, who, they will recollect, was a gentleman who gave very elaborate and important evidence, entirely corroborating the evidence on the part of the majority of the Commissioners, and who gave us some very valuable calculations, to show, upon a comparison of Newcastle with other ports upon the north-eastern coast, the increased size of vessels clearing from the port of Newcastle.

The next witness was Mr. Robinson, a large shipowner, and ex-mayor of South Shields, and one of their Commissioners, a gentleman of the greatest respectability; and, I think, he has not lowered that respectability by the very honourable course which he has taken upon this occasion; he is a gentleman who has frequently acted against the majority of the Commissioners. So did Mr. Allhusen, as he tells us. Those two gentlemen, who were examined by me, frequently acted, as will be seen by the minutes, against the majority of the Commissioners. Mr. Robinson has voted on several occasions with Mr. Stevenson,

Mr. Seymour.

31st January 1855.

and, therefore, was a gentleman whose appearance on behalf of us was at all events a proof that although having entertained once a strong impression the other way, and admitting, as he says now, that he entertains it still, yet that in his opinion majorities in all bodies ought to prevail over minorities, that if a large majority in any body are satisfied of the useful character of a certain object, their position, as a majority, entitles the matter to have a fair trial, and that this state of things ought to secure the majority against a factious opposition. Mr. Robinson says that he severed himself from the later proceedings of the party with which Mr. Stevenson is identified. Avowing a difference of judgment he scorned a "factious" opposition. He, too, bore testimony to the improvement of the navigation.

Sir, Mr. Philipson was next called before us. He also spoke of every attempt having been made to conciliate; he repudiated the attempt which was made to impugn his character, by alleging that he had used his influence for Messrs. Palmer; and he entirely knocked asunder, I think, my learned friend's case with regard to the quays at North Shields. As I am reminded, Mr. Philipson confirmed that which has been my argument to-day, which was stated by others, that the interest of the coalowners and of the merchants in Newcastle was in favour of the deep water at Shields; that it was their interest to have a deep bar, which appears to me to have been the object of Mr. Brooks, and the direct result of the operations which have been carried on along the river.

Sir, I do not think there is any other matter to which I need refer. There has been a good deal said about the cost of dredging. If the estimate of Mr. Rendel is before the Commissioners, I think they will observe that it is 5,000*l.* a year, our outlay is about 4,000*l.* Mr. Ure told us also, as I am reminded, that the cost in the Clyde was 1*s.*, or 2*d.* higher than in the Tyne. But upon these matters I need not now enlarge, they seem to me to be really matters in detail, because suppose the Commissioners are of opinion that the majority of the trustees have not failed in their trust; that Mr. Brooks' operations have not proved wanting in their principle or in their execution; then it does appear to me, that whatever suggestion may be made as to greater economy, as to the ballast dues, or the ballast deposit, or the deposit of the dredged materials upon the river side, as to which the minority have complained, those are only matters in detail, and they do not at all involve the one great question whether the operations which have been hitherto conducted are or are not successful. The result of those operations, as shown by Mr. Comrie's plan, is that the bar has improved in depth 1 foot 3, as compared with 1813; that Shields harbour has improved in depth and capacity; that the sailing channel between Shields and Newcastle has greatly improved. The evidence also of Mr. Comrie junior, proves that the strength of the currents, tested in the precise position selected by Mr. Rennie, is rather stronger as compared with 1813.

Sir, on the whole, I ask the Commissioners, whether pausing on the case of my learned friend Mr. Webster, he did or did not prove this grave charge which has been urged against the majority of this Commission? But, Sir, we have not paused there. We did not oppose the motion in the House of Commons; we have offered no opposition here. We have produced everything in our power, every map that we possess, and we have rendered every assistance, either to the Commissioners or to our opponents. And what is the conclusion to which we ask the Commissioners to come? We ask them, looking to these things, not to say that we have abused our trust. We appeal to our position as commercial men interested in the Tyne, as having one common interest here, and we say that it is our highest interest to have the channel of our river deepened, and, above all, the bar deepened. We appeal to our position in this community as some argument in answer to the charge that we are abusing our trust. We appeal also to the works which we have performed under this Act, and the works in progress, in answer to the various charges which have been made against us by the minority of our own Board. No one regrets more deeply than do the majority of the Tyne Commissioners that this Commission should have been sent down, and they regret it for one reason only—not that they fear the evidence which is laid before them, or the publication of that evidence—not that they apprehend a hostile verdict upon the course which they have taken—but they do regret that the minority in their body did not pause before they gave publicity to accusations so grave, and placed themselves in the awkward position in which they now stand, as having published these charges to the world, but when challenged to substantiate them, and when the Government have given them an opportunity of establishing them, not only not supporting their charges, but having really made a complaint without proving any one of the principal and main assertions which were opened by the "counsel for the prosecution."

Sir, in conclusion, all I can say on behalf of my clients is, that they believe that there is one solution and one way of healing the discord, and uniting again the divided elements of their body. They do not look to foreign aid or to Admiralty control. They entertain no disrespect to the Admiralty. They rejoice in getting the support of the Admiralty in any of the great works which they carry on, in asking their counsel, and having the most friendly intercourse with them. But they feel that they are themselves capable of entirely managing their own concerns. Their local interests are deep in the conservancy with which they are intrusted, and they say that no superintending power can increase their zeal or multiply their labours, and that you cannot deprive them of this consolation whether you pass judgment with them, or against them. The main cause of the strife, the one object of contention from the beginning of that minute book to the end, is that certain gentlemen in the Commission, entertaining peculiar notions of the opinions of Mr. Rennie, or of other

Mr. Syemour.
31st January 1855.

engineers have, with more or less pertinacity, insisted upon carrying forward their views, regardless either of times or of seasons, or of the judgments of those before whom they have brought them. After defeats, they have returned to the charge, till from a friendly opposition they have become an exasperated faction! But we say, that all this has sprung from a difference of opinion as to the principle which should be followed in improving the navigation of this river. Let the principle hitherto pursued be said to be true or not, or at all events, let it be said whether that principle ought or not to have a fair trial. If it be pronounced, as the result of this investigation, that having heard all, you are of opinion that the Commission has so far entitled itself to your recommendation, or that the case against it has been so weak, and so unworthy of reliance, that you think a further trial ought to be given, then, I believe that the result of this Inquiry will be, that harmony will be restored in our councils, that good feeling will reign again, that united action will exist amongst us, and that Mr. Allhusen and Mr. Cowen will not strive in vain to produce unanimity at the meetings of the Commissioners. And I cannot close without expressing the hope, that both majority and minority unmindful of the past, will hereafter strive, not to gain a victory with reference to any question of full-tide walls or of half-tide walls, but to excel, each his fellow, in consulting for the benefit of the town of Newcastle, in harmony with the two Shields; and that they will all, like well-regulated currents, bring their energies into one common channel, conducing to the general good and the welfare of the large population whose interests are bound up in the prosperity and improvement of the Tyne.

(*Mr. Stevenson.*) Mr. Chairman, there is a very considerable misunderstanding upon the subjects to which the learned Recorder alludes. I felt it very hard to sit still under what I could not help considering imputations, and I really should like to know what opportunity I can have of putting right what I am afraid is a misunderstanding, injurious to myself, which has got abroad.

(*Chairman.*) We are very sorry, but we cannot re-open the case. The arrangement decided upon yesterday was, that the learned Recorder should conclude the whole discussion. It was quite natural that, in the course of his speech, he should allude to matters in a way with which, perhaps, gentlemen of the minority might not be pleased; but in affairs of this sort you must not mind little rubs of that description. I do not think it is possible to allow any further explanations of that kind to be made now. There is one question which I wish to mention: the Admiralty insist very much upon the dredging of the 9 feet bar, you call it the stones; is that in progress?

(*Mr. Brooks.*) A reference to Comrie's survey will show that there is no 9 feet bar; it has gone.

(*Mr. Cowen.*) A reference to the present survey will show that it does not now exist.

(*Chairman.*) Have you communicated that to the Admiralty? It is one of the things which they insist upon.

(*Mr. Cowen.*) It is one of the things which we agree to do, and must do. We are getting a new dredger, which, should that obstruction be found to exist, will operate and remove it.

(*Chairman.*) Mr. Brooks will take care that Mr. Stevenson has the documents which he wishes to have.

(*Mr. Brooks.*) Yes, Sir.

(*Mr. Cowen.*) I am requested to thank the Commission for the very courteous manner in which they have attended to everything which we have had to say.

(*Mr. Stevenson.*) I hope the chairman of the Conservancy Commission speaks for both the majority and the minority.

Adjourned till Wednesday next, at 10 o'clock.

Wednesday, 7th February 1855.

J. M. Rendel, Esq.
7th February 1855.

JAMES MEADOWS RENDEL, Esquire, sworn.

3927. (*Mr. Webster.*) I BELIEVE you have had considerable experience in the navigations and estuaries of the United Kingdom?—Yes; I have been consulted upon a good many of them.

3928. Were you consulted in August 1848 by the Corporation of Newcastle, then the Conservators on the state of the Tyne?—Yes.

3929. I believe that was immediately after the Inquiry before Captain Washington on the Low Light Staiths?—I cannot tell whether it was immediately after, but an Inquiry by Captain Washington and other Inquiries were put into my hands at the time I went down first, and I had all the results of those Inquiries before me at the time I went.

(*Mr. Webster.*) I do not know, Sir, whether you have Captain Washington's report upon this Inquiry, it was in 1848; the evidence is in print, but I believe the report is in the Admiralty still.

(*Chairman.*) If you think it necessary, we will apply for it.

(*Mr. Webster.*) Yes, Sir; it is part of the history.

J. M. Rendel, Esq

7th February 1855.

3930. (*To the Witness.*) I think you gave evidence in the session of 1849, in opposition to the Shields Conservancy Bill?—Yes.

3931. Evidence in the House of Commons?—Yes. I have given evidence upon Tyne matters repeatedly in the House of Commons.

3932. I am directing your attention at the present moment to the Conservancy Bill of the session of 1849. I think you had been employed in the autumn of 1848, and in the spring of 1849 the Bill was in Parliament?—I would rather you would put into my hands any documents, so that I might see them. I have given evidence so often upon the questions of the Tyne, that my only fear is, that I shall confuse the evidence given upon one Bill with the evidence given upon another.

(*Mr. Armstrong.*) You are entitled to see it.

(*Mr. Webster.*) On a preceding day, Sir, some questions were asked about the original Conservancy Bills, as introduced in 1849 and 1850. I told Mr. Brunel that a copy should be produced; they were very scarce, but I believe that Capt. Linskill and Mr. Wyatt succeeded in obtaining two copies (*producing the same*).

3933. (*To the Witness.*) I think you were engaged in making a very elaborate survey, were you not?—Yes.

3934. Your report, which was made upon that, is dated 11th October 1851. Have you a copy of your report?—No. I can only state that I am here without any papers, simply because I did not know what questions were going to be asked me. All I can say is, that I am perfectly familiar with the whole question of the improvement of the Tyne, and that, taking it as a whole, I can answer any questions; but that if the object is to inquire into my connexion with it at various times and before various Committees of Parliament, I am quite sure the Commissioners will see that it is necessary for me to refresh myself by referring to the dates of those investigations, and to the circumstances which induced the evidence that was given. Of one thing I am perfectly satisfied, nothing in anything that I have said or done, either in public or before the Commissioners at Newcastle, will be inconsistent with the views I entertained from the moment I had an opportunity, by Mr. Comrie's most elaborate investigation, of deciding upon the question of what was best for the Tyne as a whole.

(*Chairman.*) Would there be any objection to allowing Mr. Rendel to do what Mr. Brooks did, namely, to give us his opinion at once in the shape of an outline, and then we should avoid that difficulty which he feels, and very naturally, after the lapse of six years.

(*Mr. Webster.*) I was going to put Mr. Rendel's report into his hand, Sir, and to ask him one or two questions upon it. I was only refreshing his memory that this report was produced three years after the first instructions.

(*Chairman.*) We have here Mr. Rendel's own survey, from Newcastle.

(*Mr. Rendel.*) Of course, if the Commissioners think it necessary to ask me any questions of comparison between the state of the river at one time and its condition at another, I must have reference to the surveys, &c., made under my own direction in 1848 and 1849, and the comparative ones made since. Having received an intimation from the secretary that you desired to see me here to-day, I wrote and requested to have an opportunity of comparing those charts. Your secretary called at my office, and said that I could have reference to them here; but really I have not had an opportunity of coming down here to look into the documents, and if I look into them with the degree of care which is absolutely necessary before I express an opinion before this Commission I ought to have those documents in my own office, carefully under my own observation, and to make those minute comparisons upon which alone an engineer, if he has any regard for his character, would offer an opinion. Therefore, if I am to be asked any questions as to the state of the river now, as contrasted with its condition in 1849–50, a careful comparison of the charts must be made by me with respect to the general character of the Tyne, and what I regard to be the proper mode of treating it. I am ready now to be examined; but if I am to be asked questions of fact and questions of degree as to the state of the river at one period and the state of the river at another, you will see at once the position in which I am placed.

(*Mr. Webster.*) I am rather in a different position, Sir, from my learned friend and Mr. Brooks. Mr. Brooks comes to tell his own story, so to speak, not as the Counsel, but as the engineer for the majority. Mr. Rendel is a person who, so far as we are concerned, has always been instructed by the opponents, so to speak, namely, the Corporation of Newcastle; therefore, what I propose to do, with your leave, will be to direct his attention to some few passages in his report, as to matters upon which I have already given some evidence, or points upon which I commented in my opening speech; but I certainly do not propose to ask Mr. Rendel any questions of facts or details, being fully aware, as you must be from an application which I made to you on a preceding day, that that could not be gone into without some re-examination. Therefore, Sir, what I was going to do was, to ask Mr. Rendel to take this report into his hand, and to ask him some questions upon different parts of it, with reference to the sort of case which I make before you on behalf of the minority. Mr. Rendel, of course, will object on the ground of his inability to answer the question, and that is all I can do.

(*Chairman.*) I think Mr. Rendel may go on giving his evidence until he finds that questions are asked him which he objects to answer until he has had an opportunity of refreshing his memory by reference to documents.

(*Mr. Rendel.*) I will do that, Sir, if the Commissioners wish it; but I beg to state that I

J. M. Rendel, Esq.

7th February 1855.

stand by every word uttered in my report. No circumstances have occurred, no new facts having been furnished to me. Several times since that report was written I have been asked by the Commissioners of Newcastle to reconsider certain parts of it. I have said, Yes, with the greatest pleasure, if you will bring before me any new facts. But, inasmuch as no new facts have been brought to my notice, I cannot change my views, which were the result of three years' inquiry and observation, based upon the most minute surveys. The report so made contains my opinions as to what I thought best for the Tyne as a whole; and I beg you to understand that I draw that broad distinction, and that without some new facts brought to my knowledge as to alterations in the set of the tides, or changes that have taken place in the mouth of the river, or of some circumstances or other of that nature, unless those are brought to my notice, I could not, if examined for a week, and made to write volumes on the subject, say more than will be found in my report.

(*Chairman.*) I do not apprehend that Mr. Webster has the least intention of bringing forward any new facts.

(*Mr. Webster.*) No, Sir. I am sure Mr. Rendel is quite an experienced witness enough to stop me if I am out of order.

(*Chairman.*) Our object is not to tronble Mr. Rendel to come here unnecessarily, if possible. Of course, if he says he cannot go on with his evidence without documents, we must postpone it; but if he could now give his evidence satisfactorily to himself, and also to the parties on both sides, it would be a point gained, I think. Mr. Rendel would not wish unnecessarily to take the task upon himself of looking over all the charts and documents of six years ago.

(*Mr. Seymour.*) As far as I am concerned, Sir, if we have the result as appears by Comrie's survey, we shall be very glad to have some opportunity of examining Mr. Rendel as to the comparison of those soundings with the soundings of 1849; it would be very important to us.

(*Chairman.*) Let us go on with the examination as far as we can, and when it is absolutely necessary we will stop it, and send to Mr. Rendel all the papers for him to look at them, and we must have another day for the Inquiry; let us try if we can get on at present.

(*Mr. Rendel.*) Might I ask one question; I hope I am not brought here at the instance of either of the parties?

(*Chairman.*) No. You have been called by us that we might have the benefit of your opinion; it is entirely our own spontaneous act and deed. As you had surveyed the Tyne, we considered you a competent and valuable witness.

(*Mr Rendel.*) Then, Sir, I shall be very happy to give any information I can.

3935. (*Mr. Webster.*) This report of 1851 was made after three years' investigation?—Yes. I represented to the Commissioners that I thought the questions referred to me were of so complicated a nature that no engineer ought to report as to what was best for the Tyne without most minute, careful, and deliberate investigation; and that report is the result of such investigation.

3936. Will you have the goodness to take a copy of the report in your hand? Will you look to page 17 of your report? You have, in the preceding part of the report, commented upon the works, and then, at that page, you proceed to describe the order in which the works should be executed. I will ask you whether, in your opinion as an engineer, and with reference to the character of this estuary and its bar, you adhere to the opinion, that works at or near the bar were works of the first importance?—I think the lower part of the river is the portion that ought to be first put into a condition of improvement. I do not believe there is any difference of opinion upon that.

3937. By the lower part of the river, I observe that you say, "The whole of the works "between the bar and Bill Point are so necessary to any very considerable improvement in "the navigation, that they should be regarded as the first section to be executed"?—I think so.

3938. Is there, in your mind, as there appears to have been on a preceding occasion, a distinction to be drawn between the estuary up to Bill Point, or about Bill Point, and the part above, the one being the estuary and the other the river?—I think that this might be taken as a fair division, looking to the order of precedence in constructing the works.

3939. I observe that you further say, "The first work set in hand should be the south "pier"?—Yes.

3940. Will you tell the Commissioners what was the reason of the importance which you attach to that south pier?—My reason for advising that the south pier should be the first operation was to get the tide as early as I possibly could upon the young flood into the river. I believe one of the great causes of an insufficient tidal flow up the river is the way in which the tide comes into the harbour with reference to the Tyne mouth headland.

3941. Will you explain, by reference to one of the charts, what you mean by that?

(*Chairman.*) I think it will save time if I mention that the Commissioners have decided that the question of the piers, having been already entered upon by the Admiralty, is not at all committed to our Inquiry, and, therefore, that it would be unnecessary to have any examination upon the question of the piers. We consider that that question is decided; that it will be put into Mr. Walker's hands by the Admiralty, and that all the preliminary

steps will be taken for constructing them; therefore we do not think that it comes within the scope of our duty to go into any further inquiry upon that subject. *J. M. Rendel, Esq.* 7th February 1855.

(*Mr. Webster.*) I think, Sir, if you have formed that opinion upon the point, that you must have been under a misconception of the real facts of the case, if I may be allowed to say so. You will remember that I failed in getting from Mr. Clayton the real state of things with regard to the piers, and I understood that the correspondence was to be put in, which was only imperfectly given, and which related to a great number of negotiations between Mr. Clayton and Mr. Walker, and Mr. Walker and the Admiralty, and Mr. Clayton and the Admiralty, as to which a very small part is before the Commissioners. And I understand, Sir, that in point of fact the Admiralty have not done that which is supposed; that there has been no plan of the piers approved of. Certainly, the Commissioners are not aware of it as a body. There have been proceedings of this pier committee, which is one of the matters of irregularity which I brought before you, and I must say, on behalf of the minority that they feel most strongly upon the position of the pier question altogether, and they do not believe that the Admiralty have approved any plans at all.

(*Chairman.*) I think that you are under a mistake so far. The Admiralty have approved entirely of the principle of the piers, but they made some objections as to the plan and specifications; and we do not consider ourselves at all bound to enter into that matter. The question of the piers is already decided, and it is put into Mr. Walker's hands; therefore I think we shall only waste our time by discussing it. We have made up our minds upon it; it is not a thing which the Commissioners have done hastily or rashly. We have had a discussion upon it, and are unanimously agreed that it is not within our competence to inquire into the question of the piers, so that I think you must take that as decided.

(*Mr. Webster.*) Sir, the question of the conduct of the piers, with reference to the effect upon the harbour, and with reference to a matter upon which some evidence has been already given, and as to which more will be given, namely, the Tynemouth Dock of 1853, is one of the most vital questions to the Shields people that can possibly be, and therefore if you really have come to a conclusion of that kind, I must say most respectfully, perhaps I ought not to say that it is premature; but the question has been disposed of before one half of the case has been heard. Although Mr. Rendel has been called at your instance, you will remember that it was at my express request on the behalf of the minority that, inasmuch as he had been so many years investigating the Tyne, and no person probably might be presumed to know more about it, this Inquiry might not be closed till he had been called; and one of the questions which we wanted to bring before you was the state of the question regarding the piers in connexion with a matter as to which you have had some evidence already, namely, the Tynemouth Dock of 1853, which was opposed by the very Commissioners, although it was a plan identical with what Mr. Brooks had himself recommended in 1845. Of course, I do not mean to go further into this than is necessary for the general conservancy questions; but I must express my hope most sincerely that I shall not be precluded at the last moment from entering into this matter, which affects the whole harbour question.

(*Mr. Armstrong.*) What do you propose about the piers?

(*Mr. Webster.*) What I propose, Sir, is to do this—to lay before you Mr. Rendel's opinion as to the peculiar character of the mouth of this estuary, and as to the peculiar character of the bar and the impossibility, as the minority think, of that being properly dealt with, excepting by works of a similar kind to those which he himself projected, and which are supposed to have been approved by the Admiralty, and which I believe to be so. And, Sir, I am fortified in the objection which I now make, because I understand that since this Inquiry began at Newcastle, the shipowners both of North and South Shields (there is a society at each place) have become, I was going to say, very much alarmed; they have become aware of the state of things from the correspondence which has been printed, which was supposed to be a secret correspondence between Mr. Walker and Mr. Clayton. You will remember, Sir, that I pressed Mr. Clayton very much (and I am afraid some of the Commissioners thought I was carrying the question further than was necessary) upon questions relating to this pier correspondence. Mr. Clayton said distinctly that he had done all he could to get the matter expedited between March and September 1854, I think. It turns out now that there was a correspondence, which has since been printed by Mr. Walker, relating to that very matter, which discloses that a great deal had been done by the Commissioners without any authority at all; I will only allude to one matter which appears in that correspondence. I asked Mr. Cowen, the chairman, some questions as to the fact upon whose authority land had been purchased at the mouth for these piers and stone quarries opened, and matters of that kind, as to which I was then imperfectly acquainted, because they having all the documents in their hands and we having none, it was not likely that those who instructed me could be informed upon it. It appears upon that very correspondence that Mr. Walker himself objected to what the Commissioners were then doing. If it is to be said now that this is a question concluded, that the Admiralty have put the thing into Mr. Walker's hands, and if there is a correspondence in print which has not yet been brought before you, which I could not get, though I believe it to exist (Mr. Clayton would not produce it), if that be the state of the case, and Mr. Walker, who has this responsibility, objected to the proceedings of the Commissioners, is not that a most vital matter for your Inquiry here, when you are reviewing the conduct of the Commissioners with reference to their proceedings since 1850? And, Sir, it is part of the general question. Your Commission, Sir, is not limited to what has taken place since 1850 in any way. No doubt it is a matter of

J. M. Rendel, Esq.

7th February 1855.

charge, which I have certainly never meant to make as a personal charge against any of the Commissioners, they can only be responsible since 1850; but your Commission is to "inquire whether the encroachments on the tidal waters of the river by jetties, embank-"ments, and other works executed and proposed on the banks thereof have not injured "the navigation, and will not continue to counteract the plans for removing the "said banks at the mouth of the river, and otherwise injure the navigation of that "important river." There is nothing whatever about time there, Sir, and therefore, my case is this; that the state of things at the bar now, the state of projected things, and the way in which the work has been done, as is said, under the authority of the Admiralty, which I respectfully deny (it is not proved), or under the authority of Mr. Walker, which Mr. Walker by that secret correspondence denies, is a matter of the first importance for you to inquire into, as to its effect in removing the sand-banks at the mouth of the river.

(*Chairman.*) Allow me to remind you that the dissentients, in the letter to Sir James Graham of the 3d June 1854, did not say one word about piers.

(*Mr. Seymour.*) Nor my learned friend in his opening speech.

(*Mr. Webster.*) No, Sir, because they did not then know what had been going on; and that is one of the most grievous complaints which I shall have to make before you, Sir. The public mind is now being aroused at Shields by reason of their having become aware, from the publication of this secret correspondence, of what has been doing. It is a matter which has come to their knowledge since that letter of the 3d of June was written. It is a matter which, as you must be aware, Sir, I was not satisfied about, because I made a great many attempts to get the evidence in, but owing to Captain Linskill not having been a member of the piers committee, and being imperfectly instructed, I was not able to do so. You will remember, Sir, that Captain Linskill was refused to be put on the piers committee. Therefore, if they have so managed matters by packed committees, or committees of a peculiar character (which is a part of the complaint which we have to make), that we could not get informed as to the facts; if they have so disturbed and dislocated matters, and eventually the truth comes out, surely it is a little contrary to the practice of all Inquiries of this kind to shut your eyes to any important matter which is brought before you in any way up to the very last moment. It is not done even in an election committee of the House of Commons, or in any tribunal of that sort which has the power of inquiry generally. Nothing but a tribunal trying a cause at Nisi Prius almost is bound by rules of that kind. Therefore the fact of the six gentlemen of the minority who signed that letter, which was as early as June, not having put that matter into their letter is wholly beside the question; because the resolution to employ Mr. Walker was only in March of last year, and in September was the motion of Captain Linskill, complaining of the fact that it had not been communicated to him. I say again, that the proceedings of this piers committee, and the state of things as regards these piers, and that secret correspondence between Mr. Clayton and Mr. Walker, and the way in which the Admiralty have been used and abused on this question, is certainly a matter which must, at some time or other, be made the subject of public inquiry. Therefore, I trust, that you will not, on the present occasion, where you have endeavoured to make this an efficient Inquiry, shut your ears to a complaint which must be brought before the public in some shape or other, upon the technical objection that it was not contained in that which has been represented to be the bill of indictment against the majority.

(*Chairman.*) You cannot say that the construction of the piers was secret; the first stone having been laid last year, and those whom you represent having been present at it with the other Commissioners, and having said that it was a most glorious and important event.

(*Mr. Webster.*) No, Sir; I do not say the piers were any secret; it has been a matter upon which the people of Shields, particularly of South Shields, who are most interested in it, have been most anxious for years. But, Sir, could anything be more ridiculous than the objection of the chairman, that because those gentlemen had sent that letter, which he treated as a bill of indictment, therefore they were not to dine together afterwards on the laying of this first stone of a great national work, as to the details of which they were then wholly ignorant? If you look to the duties and the course of inquiry, you will see that the gentlemen who instruct me have been kept positively in the dark; and it was not until after I had left Newcastle that I received from there a copy of the secret correspondence between Mr. Walker and Mr. Clayton, which appeared in the newspaper of this day, and that those instructing me were at all aware of the state of the case.

(*Chairman.*) We had better request the gentlemen to withdraw.

(*Mr. Seymour.*) As I have not been heard, I merely protest; I do not agree to anything that has been said.

(*Mr. Webster.*) Nobody indicted ever did.

(The parties withdrew, and after an interval were again called in.)

(*Mr. Armstrong.*) I am requested by the chairman to state the determination at which we have arrived, very carefully considering this matter, and looking at the language of this Commission under which we sit here. We are to "inquire whether the encroachments "on the tidal waters of the river Tyne, by jetties, embankments, and other works "executed and proposed on the banks thereof have not injured the navigation, and will "not continue to counteract the plans for removing the sand-banks at the mouth of the

"river, and otherwise injure the navigation of that important river." We conceive that it was intended by that to exclude from our inquiry the plans of the piers, for which an Act of Parliament has been obtained, and we understand that the particular line of the piers has been agreed upon; and that it was not intended that we should open that question in considering whether the river has been dealt with in such a manner as to be likely to counteract those plans for removing the sand banks. With respect to the position of the piers, if that is what Mr. Webster is about to enter into, we do not think that comes within our inquiry.

(*Mr. Webster.*) I do not intend going into the question of the precise position of the piers; but we are in this difficulty—we have never seen, and I do not think you have ever seen, what are the piers which the Admiralty have sanctioned.

(*Mr. Armstrong.*) I understood that you were about to open the whole question of the piers, and to call upon this Commission to determine the best line of piers, and to open a very large question indeed, which we conceive upon the letter of the Commission is not before us.

(*Mr. Webster.*) What I understand to be the state of the case is this:—The Admiralty have sanctioned piers as regards position; I believe that to be the case, so I am told Sir. But it is a most material question as regards the extent, and particularly as regards the north side, upon which the shipowners of North Shields, I understand, presented a memorial to you. Sir, there is this question arising also. Assuming that we had before us the extent to which the piers were sanctioned (I take the north side for instance) I should have asked Mr. Rendel as to extending an inner pier of the kind that was proposed by him, and of the kind that was under inquiry when the Tynemouth Dock was before Parliament in 1853; and whether, unless such a thing was done, it would not so interfere with the state of things, that it would obstruct the bar within the outer pier, and obstruct the Narrows rather than improve them. That was the kind of inquiry which I should have gone into. We are very much in the dark. There have been no plans put before this Commission; and these plans, as I understand, I have never seen them——

(*Mr. Brooks.*) I delivered them in; the plans are approved of.

(*Chairman.*) Is there any plan here? There is Mr. Walker's own report.

(*Mr. Brooks.*) I can put in a copy.

(*Mr. Webster.*) But the Admiralty have not approved of that, Sir.

(*Mr. Brooks.*) They have.

(*Mr. Webster.*) I am told not. Where is the approval? Why is not Mr. Walker called, or somebody to prove it?

(*Mr. Seymour.*) It was proved at Newcastle. The Commissioners of the Tyne agreed to Mr. Walker's deciding with the Admiralty upon the plan, and carrying out the piers. The question of the extent and position of the piers is a question which the Admiralty have taken in hand in conjunction with Mr. Walker.

(*Mr. Webster.*) I ask what the Admiralty have approved? I ask that question of fact, and perhaps my learned friend will show us the proof.

(*Mr. Seymour.*) I do not think I am called upon to answer this question. The question of the piers has been left by the Tyne Commissioners to Mr. Walker and the Admiralty; and I would submit that the decision to which the Commissioners have come already points to the true interpretation of these powers. Mr. Walker was agreed to by the Tyne Commissioners; he subsequently saw the plans of Mr. Brooks, which he approved of; the matter is now taken up by the Admiralty, and how far that can be a matter affecting an inquiry connected with the river, it seems to me difficult to say.

(*Chairman.*) I apprehend that those two piers are substantially as nearly as possible what the Admiralty intend should be executed, and what they have approved of. There may be some little modifications as to the mode in which they shall be executed. The plan and the specifications have been quite agreed to. Taking it as a whole, those two piers are agreed upon by the Admiralty. You do not mean to dispute that, do you?

(*Mr. Webster.*) I do not mean to dispute (I do not know that it has been proved) that the Admiralty have approved of the piers somewhat in this position; but a most material question is the extent of them in connexion with inner works.

(*Mr. Armstrong.*) We conceive that this question of piers is not before us.

(*Mr. Webster.*) If this should be the state of the case, assuming that the Admiralty have sanctioned a pier of a certain extent, it may be that a pier of a certain extent on the north shore would not be injurious; that may or not be.

(*Mr. Brunel.*) As the Commissioners are of opinion, and have expressed that opinion, that their inquiry is limited to the works upon the banks of the river, I think, with submission to the President, that we ought not to hear any discussion about the piers at all; and I am particularly anxious upon that, because, as a professional man, I do not wish to be drawn into any question upon a point on which I am not called upon to join in an expression of opinion. As it is the opinion of the Commissioners that the question of the piers is not within the scope of our inquiry, but that we are limited, under the terms of the Commission, to the works executed on the banks of the river, I would submit that we ought not to allow any discussion whatever upon that matter, or any reference to plans. In fact, probably I should venture before the Commission to object to our retaining possession of any plan of the piers now decided upon, if we have it. I do not know that we

J. M. Rendel, Esq.

7th February 1855.

have; because as one of the Commissioners, and as a professional man, I object to my cognizance at all of that on which I am not called upon to express an opinion.

(*Chairman.*) I think Mr. Webster sees now what the opinion of the Commissioners is, and that he will confine his examination of Mr. Rendel to those points which relate to the banks of the Tyne, and to the alleged encroachments which have been made upon it by embankments, jetties, and other works executed.

(*Mr. Rendel.*) As my time is up, I must leave you. I would only say this, that I am quite sure that after such decision, I can be of no use before the Commissioners, because I could not give evidence; and I venture to affirm, that no man who has the smallest regard for his character, would give evidence upon a question affecting the improvement of the Tyne, without knowing what were to be the works constructed at the mouth of the river. I said just now, in the few answers which I gave to questions, that I refused to report until I had investigated the river as a whole. I take it that any engineer who would say that this or that plan was the best for the improvement of the navigable channel of the Tyne inland, without knowing and having previously made up his mind as to what was to be the nature of the piers at its mouth, would be a man who would have very little regard to his reputation for the future. I am quite sure that it will be a relief to you, and it will be a very great relief to me, to refer to my report instead of giving further evidence, which could only be suppositious, unless I know what is to be done at the mouth of the river. I will come again if you wish it, but I am only anxious to save your time, because the first question which I should be obliged to ask, if required to give an opinion as to whether there should be half-tide or whole-tide groins or walls as the plan for improving the river would be, what are you going to do at its mouth? Therefore it would be quite impossible for me to render you that information which I should desire to furnish, unless I knew what the plan of entrance is to be. I am sure that the engineer upon your Commission, Mr. Brunel, will see that any engineer would think as I do on this point. I will come again if it is wished.

(*Mr. Webster.*) I certainly, Sir, shall think it my duty to put some questions to Mr. Rendel on other matters.

(*Mr. Seymour.*) I should make a respectful application to the Court that Mr. Rendel be allowed to see Mr. Comrie's soundings in the meantime.

(*Mr. Webster.*) And perhaps he will bring a list of the appendix.

(*Mr. Rendel.*) I really have only my private documents connected with the Tyne. I sent all others back with the appendix to my report.

(*Mr. Seymour.*) May I ask whether it is the intention of the Commissioners to have Mr. Robert Stephenson examined?

(*Chairman.*) Yes, we fully intend to ask him to come.

Adjourned till to-morrow, at 12 o'clock.

Thursday, 8th February, 1855.

J. M. Rendel, Esq.

8th February 1855.

JAMES MEADOWS RENDEL, Esquire, further examined.

(*Chairman.*) ALTHOUGH neither the dissentients themselves, nor the honourable Member for Tynemouth, who moved the address, and to whom we applied afterwards for such information as he thought proper to give us as to the reasons for moving that address, mentioned the proposed piers as a cause of complaint, yet as there may have been some understanding that an inquiry on this subject would be entered into in London, the Commissioners propose to receive evidence, and to include in their inquiry the question of the probable effects of the works now proposed to be executed in the construction of the piers at the mouth of the river as defined by the plans proposed by Mr. Walker, which have been adopted by the Tyne Commissioners, and approved of and sanctioned, to a limited extent, by the Admiralty; but they do not consider it within the limits of their province to inquire into, or to form any opinion upon the relative merits of any other plans.

(*Mr. Webster.*) I think, Sir, that that really meets all we desire.

(*Mr. Armstrong.*) I put the question to you yesterday, whether you meant to confine it to that plan, and you said then that you proposed to add something to it.

(*Mr. Webster.*) The real fact was, that I was taken rather by surprise yesterday. I certainly did not intend to impugn before you the policy of a pier in that position. I was going to assume to a certain extent a pier in that position, and then to examine as to the effect of that upon the inner works.

3942. (*To the Witness.*) Will you have the kindness to assume that piers, such as Mr. Walker has recommended, are constructed. I will not at present ask you any questions of detail as to the dimensions and extent of them, but request you to assume that piers, such as there represented, are constructed. I believe that what is called the bar is within those piers?—So it is marked.

3943. Assuming those piers only to be constructed, what would be their effect in connexion with the abstraction of tidal water that is going on in the estuary, if Mr. Brooks' full-tide walls are to be carried out?—I hold it to be important to propagate the column

J. M. Rendel, Esq.

8th February 1855.

of tide up the Tyne as much as possible, which implies that it should be directed into the harbour's mouth as early as possible, or simultaneously with its set along the coast at Tynemouth Head, and that everything should be done up the river that would so accelerate the tidal wave as to induce it to rise, in common parlance, upon itself as it advanced up the Tyne; and I say that, because it appears, having reference to the short distance between the coast and Newcastle, that there is an undue delay in the arrival of the tidal wave up to Newcastle, there is strong indication of obstructions at the harbour's mouth, and impediments in the river. If you look to the tidal diagrams which accompany the appendix sent in by me, you will see that that is very strongly marked, so much so that the tide, excepting under extreme circumstances, does not rise so high in level at Newcastle Quay, short as the distance is between that and the sea, as it does at sea. Therefore my idea is, that every arrangement of works which you make at the mouth of the Tyne, which does not go directly to the earlier propagation of the wave up the river, and to its acceleration when so propagated, thereby increasing its momentum, and consequently its volume at Newcastle, is bad, and that if any arrangement of that sort be permitted you must allow a larger amount of tidal water to pass through the entrance; if not, the worst consequences may be expected.

3944. That opening, without reference to the question of the set of the tide, or the precise direction of the piers, is a comparatively small opening?—I am not referring so much to the size of entrance. I am speaking as to the effect of the works on the set of the tide into the mouth of the river on the early flood. I will see what the size is, as you have asked me the question. It is 1,100 feet; it is large enough if they can maintain it.

3945. (*Mr. Armstrong.*) That is the breadth between the piers?—The breadth of the entrance between the piers.

3946. (*Mr. Webster.*) The bar you have stated, as shown there, is within those piers?—The bar is marked here considerably within the piers.

3947. I think it was always part of your plan that there should be inner works?—I think the question is raised, now the Commissioners have decided that this is not a question of comparative plans, and therefore before answering the question I should like to know whether it is not opposed to the determination of the Commissioners?

3948. You were examined on the Tynemouth Dock of 1853?—I was.

3949. You were examined then at the instance of Mr. Clayton, the clerk to the Commissioners, in opposition to that dock? You were called before Mr. Hawkshaw, the surveying officer, on the 26th of April, at the instance of Mr. Clayton; that was the answer which you gave on that occasion?—Yes.

3950. Do you know whether that dock was opposed by the Conservancy Commissioners?—I do not know that; all I know is that I was examined.

3951. With reference to those docks and the effect which they would have upon the current and the sand at the mouth, were you of opinion that those docks were part of a system in connexion with two guiding piers, which would be essential for removing the sand from the bar?—Yes. I consider that it is absolutely necessary to the proper propagation of the tide up the river, to which I have before referred, that we should minutely define and permanently fix a considerable length of the channel at the Narrows, and accordingly I so laid out the works. Any docks which you choose to construct on the north of the northern of those guiding piers, or on the south of the southern guiding pier, and which would leave enough of the beach to the eastward of them for the sea which got in at the entrance to break itself upon any works which you may so construct landward of those piers, will be no disadvantage to the navigation.

3952. Passing from what took place at the instance of the opposition by the Commissioners in 1853, to the Tynemouth Docks, let me recal your recollection to what took place before Mr. Walker, on his Inquiry, the 30th of March 1852; do you remember being examined?—Yes.

3953. Did you state then, or are you now of opinion, that inner piers are an essential part of any design for the improvement of the harbour?—I think so.

3954. Assuming that such inner piers are not constructed as part of the harbour works, what will be the state of things as regards the sea channels about the bar, and assuming piers like these to be constructed?—I believe it to be an essential part of any plan (without reference to these particular piers,) to build guiding piers at the Narrows. I say that, because anyone who looks for a moment at the formation of the Insand, and knows the changing character of the channel along the Herd Sand, must see that unless you can propagate a long column of water in a straight direction between the entrance on the Herd Sand and the broad expanse of Shields harbour, you can never get rid of the Insand; nor can you, in my belief, maintain that uniform depth of the channel beween the Narrows and the bar which is essential. You cannot have a better evidence of the amount of disease existing from malformation in the outer channel at the present moment, than in the fact that you have such a very great depth at the Narrows and so comparatively small a depth off the Middens and at the nine feet bar. In so short a distance the disparity of depth is something remarkable.

3955. Is that state of things, which you have called evidence of disease at the Narrows, also as evidence of or connected with the state of the bar and the sand the mouth?—It is connected with three different things; it is connected with the way in which the flood tide enters the river, it is connected with the loose banks of sand which

J. M. Rendel, Esq.

8th February 1855.

constitute Herd Sand and the shores at the Narrows; and further, with the tendency which the flood-tide has to follow the course of the ebb-tide, instead of making a straight channel through the Insand, evils which those guiding piers would very materially remedy.

3956. With respect to a part of your answer, that it is connected with the direction of the flood tide, are the position and length of those piers also connected with that same question?—Materially.

3957. Then so far as the flood-tide question is concerned, and the direction of it, that is a question upon the position of the piers?—Yes. If the Commissioners have before them Giles' survey of 1813, they will find at once how the flood tide enters the harbour, and the whole thing will be as easily explained as possible. What I mean is this, according to the current lines there laid down, you will find that the tide coming up from the northward overruns the harbour's mouth, or entrance, owing to the projection of the Tynemouth headland, so that the harbour is partly filled by an eddy or back stream, wheeling over the low part of the Herd Sand as well as into the entrance. In all entrances of this sort it happens that you will have ebb tide passing out of the river, whilst there is flood tide along the coast, and the consequence is, that until the tide has attained an elevation which overcomes the stream from the harbour, you do not get the stream of tide propagated up the harbour. On the contrary, in all the harbours which I know of, without exception, where the projecting headland is on the opposite side from that along which the tide comes, acting as a consequence as a groin to throw the tide earlier into the harbour, I do not know a case of a bad bar. I will instance a case which strikes me particularly, viz., Montrose. Take the mouth of the Dee at Aberdeen, and take the mouth of the Tay, and you will find cases of this sort. Therefore, in all cases where your object is to get a large volume of tidal water quickly up a river or estuary, it becomes a matter of the first importance to arrest the young flood along the coast, and to throw it into the harbour. Take Liverpool, that is a familiar case. Owing to the projection of the Liverpool, or north-shore at the mouth of the Mersey, a spring tide, rising 30 feet off the light-ship, will rise 31 feet at the Liverpool Docks; and the same tide will rise 32 feet 6 or 33 feet at Runcorn. I am only referring to this fact to illustrate how, in cases where the stream of tide along a coast can be directed up a harbour or inlet, it increases the momentum of the ascending tidal column. Lynn is a familiar case: Mr. Brunel knows Lynn. By merely cutting off a bend in the channel and making a straight cut for about 2 miles below Lynn, you get a greatly reduced ebb at Lynn. I think the last report which I had from there was that the springs rose about 18 inches higher, and ebbed upwards of 3 feet lower than before the new cut was made. I only instance this to show that it is a mistake to suppose that in an estuary the tide will not rise above itself. Where the wave is properly propagated and properly accelerated it will rise upon itself; of course, if it meets impediments in its way it cannot do so to the same extent.

3958. In reference to what you have just said to the Royal Commissioners, is it the fact that Tynemouth head acts as a great groin, under the shelter of which the Herd Sands and their extension, the bar, and the Spar Hawk, are suffered to form?—Yes; my belief is, that if you carried Tynemouth head a mile further to sea, the Herd Sand would follow it. It is the result of the strong eddy formed by that headland.

3959. Is it also your opinion that the Spar Hawk is a northern extension of the bar, consequent upon the stream of flood, being thrown off by the Tynemouth headland?—Yes; if you examine the mouth of the river Tay, you will find a strong confirmation of that opinion.

3960. As compared to the mouth of the Tay, and the river at Aberdeen, is it a different state of circumstances?—The Tay is a very parallel case to the Tyne, as regards the headland being on the north, and the stream coming from the north. The case of Montrose is the reverse. Aberdeen is not so strong a case; at Montrose you have a large accumulation of sand and gravel on the north, the headland being on the south. The tide comes from the north, and is thrown into the harbour, and then you have the phenomenon of an estuary without a bar.

3961. This Tynemouth head being, as you say, a great groin, is the effect of it to throw the current of flood tide past the entrance of the harbour at times?—The effect is to cause the flood tide to overrun the harbour's mouth. Of course, as it overruns the harbour's mouth, it is manifest that it will rise faster outside the mouth than it does up the harbour, and then a rise takes place over the low part of the Herd Sand, and hence what is called the "wheel;" then the "wheel" makes what is called the 9 feet bar on the one side of the Narrows, and the Insand on the other side.

3962. Then the 9 feet bar is partly due to this stream of flood tide being carried past the harbour?—I think it is.

3963. You have told the Commissioners that you consider inner piers an essential part of any design for the improvement of the harbour?—I think they are. I say an essential part, and for this reason: it is bad engineering to make parallel piers from the entrance to the Narrows, because in that case, whilst you propagate the tidal wave, you will also facilitate the in-run of the sea; and so, in obtaining one advantage, you will promt a serious disadvantage. You cannot, therefore, make parallel piers running the whole way. Hence the inner piers are a compromise. They will direct the tidal current to and from

J. M. Rendel, Esq.
8th February 1855.

Shields harbour, in a straight course from the sea entrance, whilst the sea will break on the sloping shore left open between them and the entrance. A most serious difficulty in Shields harbour is the Insand and the Durtwick Sand; both those sands arise from distortions in the flood and ebb tide. I was examining the old and new soundings last night and this morning; I observe that, taking the whole of the sections of 1849, and comparing them with those made the other day by Mr. Comrie, there is found an increase of depth between the Narrows and the bar, but that such increase is considerably more on the south side of the channel than on the north side. As a consequence, the spit of the Insand has grown up northward, and has thrown the flood tide more along the North Shields shore, the lower part of it. That again has produced the deflection of the current from that shore to the south shore, and the Durtwick Sand has grown up eastward, and the bandying about of the stream from the one side to the other at the Narrows and through Shields harbour is the cause of frequent changes in the condition of the Insand and the Durtwick Sand; it is just the necessary consequence; you cannot knock a stream from side to side of a river without producing corresponding eddies, banks, and deep holes. The result is necessarily a malformation of the channel.

3964. Is it a fact that the mooring of ships in Shields harbour produces a considerable amount of stream and scour?—No doubt about it; and if you remove the ships into docks, there becomes the greater necessity to be mindful what you are about at the Narrows. I apprehend that if you remove the ships from their moorings in Shields harbour, you will find a greater number and distortion of banks than now exist.

3965. Is it also the fact that such ships, while having a beneficial effect on some parts of the harbour, are injurious in others?—Whatever makes an obstruction to the free current of a river, must affect the action on its bottom and sides, and if such obstruction in a harbour is considerable, must alter its general economy. You can moor vessels there so as to block up both sides of that harbour, and so reduce the section of the channel as to force the whole stream of tide to pass between those moorings; as a matter of course you may do so, but you must in such a case have a variable channel. But one of the properties of a good harbour is to have a permanent bed and shores.

3966. You have said that you consider inner piers essential to any design for the improvement of the harbour. If you do not have such inner piers, will the effect of the flood tide admitted between openings of that kind, as shown upon Mr. Walker's plan, be that the stream will be irregular and languid between strictures from that part up to the Narrows?—I apprehend it will be so. I am speaking simply with reference to the plan before me. I do not know whose plan it is.

3967. (*Mr. Armstrong.*) It is Mr. Walker's plan.—I recollect seeing a similar plan by Mr. Brooks, therefore I did not know to whom it belonged. I can perfectly understand that, if you could by possibility make this large space within the piers a harbour of refuge, it would be a strong recommendation of the plan; but I deny such possibility; this space never can be made or kept with any depth of water, it will be a great lagoon, and you can make nothing else of it. It is larger than necessary for the purpose of destroying any waves that enter between the pier heads, and there is no object in it; it is unnecessary there, and from the absence of anything like guiding lines for the tide through this enormous space, it will necessarily become filled with sand-banks, subject to great irregularity in form and depth, and without any fixed line of channel, unless you build parallel walls for a considerable portion of the distance between the Narrows and the sea entrance, so as to give a direct course to the stream between the entrance and the Narrows. These views will be illustrated by what is taking place at Liverpool. Originally there was a great question before the Admiralty, whether the Liverpool people should be allowed to extend the wall of their docks. The opponents applied to me to aid them, on the ground that the proposed works would tend to make sand-banks on the Birkenhead shore. I was of a different opinion, from the fact that the wall was so laid down as to cut off or inclose a wide part of the river on which sand collected, and over which the flood tide expended a part of its force. The work was executed, and the result is that the tides flow higher, and consequently more tidal water passes up the river, and the only thing to be done to extend the good effects of the work is, to build a corresponding wall on the opposite side, which they must do; because, if not, all that part of the Cheshire shore will be washed down.

3968. (*Mr. Webster.*) In the case of Liverpool, would not that extension of the wall to the Bootle shore, having reference to the tide, be a parallel case to the south pier only?—Yes; I would add that I have no objection to urge against a north shore pier, if you will only extend a south shore pier sufficiently beyond it.

3969. You have illustrated, before the Commissioners, the case of the extension of the walls on the Mersey on the Lancashire shore, as giving a greater rise of tide into the Mersey?—Yes.

3970. Having reference to the position of the coast, is there not a close analogy between the Lancashire shore and the set of the tide there, and the south pier, and the set of the tide in the Tyne?—Yes, if you extended indefinitely the south pier, so as to catch the tidal flow, it would be an analogous case.

3971. Then as far as the analogy of Liverpool is concerned, that north pier is an obstruction?—Unless you extend the south pier considerably beyond it.

3972. You have said that the effect of such an arrangement without inner walls or piers

J. M. Rendel, Esq.

8th February 1855.

would be to convert it into a great lagoon. Will you allow me to ask you, in the language of your preceding evidence, whether, if you include a large tidal space between two such strictures as will be formed by the heads of such piers, the current of the flood or ebb tide will be most irregular and languid between such strictures, and, consequently, the sands brought inside the pier heads will collect under their shelter, forming banks as capacious as the varying currents of tide due to such a form of entrance?—I believe that is my own language. I have no reason to alter it; I would only wish that there should be no misunderstanding in this matter. What I mean by the character of this space enclosed within the piers, as laid down on the plan before me, being altered after the construction of the piers, is simply this: at present you must regard the *mouth* of the Tyne as extending from this rock opposite the Tynemouth barracks to the Herd sand, near the Narrows, for this reason, that we find immediately the tide flows over the low part of these sands, it not only flows up the deep channel, but also by the "wheel" stream over this sand. Now, the pouring in of the stream over the Herd sand into the deep channel, is one of the causes of the maintenance of the channel, and this is not a singular case. If you examine the form of the sands and channel, you will see that you have a submerged bank which the tide crosses with a current sufficient to scoop out a deeper channel than is due to a stream which runs through it in a direct course from the bar. If this large space be enclosed, and at the same time the "wheel" stream destroyed by one of the piers, I am prepared to show that in this space so circumstanced, you would have a diversity of channels between the sea entrance and the Narrows, and these deeps, which I will call the sailing channel or fairway, will be diminished, and perhaps split into several parts; the mouth of the harbour would be perfectly at right angles to the coast stream of tide, and there would be no fair run into the harbour. I see no reason at all why you should be able to calculate, without guiding piers, that you would have the stream of tide directly in and out of this large space, because the distance is very considerable. The distance from the Narrows to those piers is 2,000, yards, that is, nearly a mile and a quarter; now a mile and a quarter is a long distance for the stream to pass in a straight course over an expanse of such an extent, and liable to a shift of sand within it by the inrun of the sea. I believe that the result would be, if these piers were built as here laid down, that the tide, in running across their heads, would form a bar from the north pier, and that such bar would cause the stream to enter in a direction that would produce eddies and banks within the pier heads.

3973. Allow me to ask you in the language of your preceding evidence before Mr. Walker, whether you are now of opinion that any piers at the mouth of the Tyne which did not give a straight course for the stream of tide into and out of Shields harbour would be positive evils?—I think so. I think the worst consequences may be expected.

3974. In the scheme for the Tynemouth docks, which was opposed by the Commissioners in 1853, were there inner guiding piers, so as to direct the stream of the flood and ebb as part of the scheme that you thought ought to be carried out?—I only went to the extent of saying that if the docks were confined within these guiding piers, and the guiding piers so far over-ran the docks eastward as to leave a sufficient portion of the shore unenclosed for the sea to break and expend itself upon, I saw no objection to it in an engineering point of view, and I thought it would be a desirable thing to promote the trade of the port by allowing such works to be constructed when they did not interfere with the navigation.

3975. In approving of those docks, did you assume that there should be piers constructed somewhat similar to the plan which you propose, either simultaneously or shortly afterwards?—Yes. I remember giving an opinion that the Dock Company ought not to have their Act, unless they built as a portion of their work those piers, paying a portion of the cost.

3976. Did you think or do you think now that, with reference to these inner works, it would be a proper arrangement to carry out such piers simultaneously with any docks?—Yes. I say again I think it would be improper for you to allow any such works to be begun outside the Narrows that were not made in conformity with guiding piers as laid down, for the reasons I have before given.

3977. In the plan accompanying your report of 1851, you have laid down I think a complete line of river walls through Shields harbour?—No; I think I left Shields harbour very much in the state in which I found it. I considered that until docks were made to take the shipping out of Shields harbour, it would be bad policy to contract its area. I think so still.

3978. Do you remember there being a scheme for a North Shields quay in 1851?—Yes; I believe it was in 1851.

3979. That would be in the spring of 1851?—Yes.

3980. Your report was in the autumn of 1851. You had not then made your report to the Tyne Commissioners?—No.

3981. You were then acting as engineer for the Tyne Commissioners, I think?—I then had the whole scheme of river and entrance improvement, as afterwards reported upon, under my consideration.

3982. Do you remember that upon that occasion, what I will call the Shields party had a pier brought under your consideration?—Plans for such a work were then referred to me by the then Conservators of the river.

3983. I believe at that time the line of pier which you sanctioned was upon Mr. Rennie's line, or nearly so?—I would rather the plans and report were put into my hands; it is a long time to charge one's memory with details. I know I went into the plan very carefully, and reported upon it fully.

3984. Do you remember that your report was in opposition to the plan which the parties were afterwards obliged to accept from the Tyne Commissioners?—No; I do not know that; but it will speak for itself.

3985. Do you know, as a fact, that the plan which was sanctioned was only half in length what you approved?—I do not; I only know that I went into the question very carefully, and that I reported upon it to my then employers, and that I have not seen anything of the plan since.

3986. Then you do not at present remember whether it was not cut down one-half in length, and considerably in width?—No, I do not.

(*Mr. Armstrong.*) What if it was?

(*Mr. Webster.*) We have had Mr. Philipson asserting upon his oath in the evidence before you that there was no animosity in the Newcastle party against Shields. I never was more astonished at any assertion in my life than at that.

3987. (*To the Witness.*) I think you have not been often in the Tyne since you made your report of 1851?—I thought I had finished with my report, I had nothing more to say. I took three years to investigate the matter referred to me, and I did it most carefully, and reported the result. I knew the importance of the Tyne, and I felt that a few years hence those who meddled with the Tyne would have a good name or a bad for engineering skill in such matters.

3988. On your examination before Mr. Walker, which has been already referred to, you were examined both upon the piers and upon the Hay Hole Dock, I think?—Yes.

3989. Do you remember making that report, dated November 1851 (*handing a papre to the Witness*)?—Yes. I have no doubt that is a copy of the report I made; I know I made a report upon those three subjects, and this purports to be a copy of it.

(*Mr. Webster.*) I will put that in.

3990. (*To the Witness.*) You have in your report of October 1851, recommended how, in your view, the coal staiths at the Hay Hole ought to be dealt with?—Yes.

3991. Was the general principle you then advocated for the treatment of the river, the avoiding the abstraction of as much water as a full-tide dock would displace?—Yes. The principle upon which I went was this, not to take any more tidal water from the Tyne than was absolutely necessary to constitute a good sailing channel up to Newcastle, and especially pending any works at the entrance to the harbour, because it should be regarded as rather premature to deal largely with the internal economy of a river, until you saw the effect of your treatment of its mouth on the bar.

3992. Did you find in the survey of 1851, which led to your report of October 1851, that the works which had been made to the westward of Hay Hole had had the effect of shoaling the coal staiths?—I do not recollect.

3993. Did you consider that so far as the interest of the staiths were concerned, a half-tide dock was quite sufficient?—Yes. I thought that as far as the staiths there were concerned, it was a question between paying large compensation to the parties who had been permitted to erect them, and the expenditure of that sum in works that would, whilst carrying out the proper plan for improving that part of the river, also add to the facilities for shipping coals at these staiths; in other words, that a half-tide dock was a better thing for the owners of the staiths than extending them to the new channel or the necessary half-tide wall, and was unobjectionable so far as the Commissioners were concerned; that, in fact, the plan was a good compromise. The greater liability of its silting as a half-tide dock than as a whole tide dock, did not appear to me a sufficient objection to justify the adoption of the latter, and the consequent loss of so much tidal water, for I could not regard this as a "bulb" like Jarrow Slake; besides I considered that as Jarrow Slake, which is a half-tide sheet of water, has not at all silted up since the survey of 1813, it was fair to infer that this half-tide dock on the opposite side of the river could not have its deep channel along the line of staiths materially shallowed for many years to come.

3994. Were you in 1851, and are you still, of opinion that to prevent the unnecessary loss of back-water, the proposed half-tide training banks for the navigable channel, are superior to the whole-tide groins now in use upon the Tyne, the latter necessarily occasioning the rapid formation of land between them, but the former by leaving the shore liable as at present to the shore tides from half flood to half ebb, preventing, as in the case of Jarrow Slake, such formation, while the opening proposed to be left in these banks ensure safe and easy access to the existing wharfs?—Yes. I beg whilst upon this subject to state that I have not one word to alter in my report, as I have before stated I wrote it after full deliberation, after a most elaborate investigation; and consequently, unless some person brings to my notice a new fact, or shows me that there was something then overlooked by me upon that investigation, as for instance, that Mr. Giles' surveys and tidal observations were wrong in 1813, or Mr. Comrie's in 1849, then I will be most happy to go into the whole question, otherwise my opinion cannot be changed; If the learned Counsel were to ask me a thousand questions upon that report, my answer

J. M. Rendel, Esq.

8th February 1855.

would be, unless you bring to my notice a new fact, I abide by every opinion expressed therein.

3995. I was not asking you upon any passage in that report; I was recalling your recollection to what took place in 1852, when you were examined before Mr. Walker upon the Hay Hole Dock, and I asked you whether you were then of opinion, and are now of opinion, that in the treatment of the Tyne for conservancy purposes, it ought to be done by half-tide training banks, and not by full-tide walls, making solid land?—Again I say, most distinctly, Yes; and, furthermore, that nothing should induce me to trench on the receptacle of the tide in the Tyne in a manner that would materially diminish its volume. I consider that the only grounds upon which its back-water can be justifiably diminished at all is, that the navigation up to Newcastle cannot at a justifiable expense be made good without risk of some reduction, and that the same may be said in regard to the remaining existing water-side establishments between Shields and Newcastle. The question must here again be treated as a compromise between the wants of the existing commercial establishments on the river and what is necessary for the maintenance of a good sea entrance. If, therefore, you make works up the river for its improvement, without reference to the natural difficulties which exist at its entrance, the consequences will be most fatal, and hence the necessity of a strict conformity to some well-devised plan for the whole river and its entrance, in carrying out any works that may be found necessary to meet local commercial wants, and which in such a busy district as the Tyne passes through must be of daily occurrence.

3996. Then in the present state of the Tyne the abstraction of tidal water by full-tide walls and land behind them, instead of training the channel by half-tide parallel walls, is, in your opinion, bad engineering?—It is my opinion that you should get your navigable channel up to Newcastle with the least possible sacrifice of tidal water, especially pending the result of any intended works at the entrance.

3997. Are you of opinion that for conservancy purposes it is essential that you should have compulsory powers over the frontages and the landowners?—My experience is, that when you have to deal with a multitude of interested individuals, the only way that you can arrive at a speedy result is to be able to say, Gentlemen, this is a matter for the opinion of a jury or referees, if you and I cannot agree.

3998. In the plan which you laid out, accompanying this report, you showed half-tide training walls?—Yes.

3999. And you also showed openings through those in certain places, according to the requirements of persons having property behind?—Yes. The object of these openings was twofold, to give facility of access to property situated on the present shores, and to do that in a manner that would ensure a gulley or deep channel out of the navigable channel between beacon heads. The effect of such openings and the consequent gulleys would be to lessen the tendency of the shore to silt up.

4000. Of course you are acquainted with Mr. Rennie's report?—Yes.

4001. Are you of opinion that it was his intention, as evinced by that report, to make the river the agent of improving itself by means of these half-tide training walls?—Inasmuch as I consider that Mr. Rennie was a very shrewd and experienced engineer, I have no doubt that his object was to make nature help him in the attainment of his object.

4002. Reference has been made here to the Clyde. Are you of opinion that in the case of the Clyde the object was to make the flood waters maintain a deep still-water canal up to Glasgow, and that it is not a parallel case to the Tyne?—The Clyde is not a parallel case to the Tyne, and there never was a greater mistake than in supposing it to be such. I am quite sure that before a Commission of naval gentlemen and engineers I need not go into the distinction.

(*Mr. Brunel.*) At the same time, if Mr. Rendel has that opinion, it would be a great assistance that Mr. Webster should suggest to him to give his reasons.

4003. (*Mr. Webster.*) Is the Clyde a bar harbour?—It has no sea bar or cross tide.

4004. Will you point out in what respect the Clyde and the Tyne are similar or dissimilar?—The Clyde for nine miles below Glasgow is only from about 200 to 350 feet wide; its channel, which is comparatively straight, has been made deep by dredging, and is now maintained chiefly by the flood waters of the river, confined as they are in such a narrow channel. The rise and fall of the tide in this channel being only about hal fthat due to the Tyne, the tidal backwater is comparatively of little value in maintaining the navigation up to Glasgow, and as there is no sea bar or tidal stream across the outfall of the river, the necessity for a large volume of tidal water, as is the case in the Tyne, does not exist in the Clyde. In short, the Firth of Clyde is a funnel having a small rise of tide through it, but ending in a very long and narrow spout, which, though it receives tidal water, is of such a contracted capacity as to be maintained by land floods and dredging. You may undoubtedly embank the Tyne from Newcastle to Shields, as they have the Clyde from Glasgow to Donglas, and with the aid of dredging, probably with the same results, but you cannot change the form of the coast or the cross course of the tidal stream into the deep converging shores of the Firth of Clyde, nor make the tide run true up and down it. Hence the difference in the two rivers, and the necessity for their different treatment.

4005. You say that in the Clyde nearly all goes up by steam-tugs?—Nearly all.

4006. Is that because you regard the Clyde a deep fresh-water channel up to Glasgow?—Yes. If there was any occasion to deepen the Clyde still more by dredging, its peculiarities are such that I have no doubt its land waters would maintain it, aided by dredging; but the case is not so as regards the entrance to the Tyne.

4007. You have made allusion to the distinction between the trade on the Clyde and the Tyne, that in the Clyde almost everything goes by steam?—It does.

4008. In the Tyne is the sailing channel, or the facility of vessels getting up, of importance, independent of steam?—No doubt about it; it is of very great importance. Vessels employed in the coal trade cannot pay unnecessary expenses.

4009. You have said that the two cases are entirely distinct; in your opinion is the maintenance of Shields harbour dependent almost entirely upon the operation of the tidal flow?—I think so.

4010. You recognize the distinction between the estuary up to Bill Point, and the river above Bill Point?—Yes; I do draw a great distinction.

4011. Then may we take it that the Tyne presents the two cases of an estuary dependent upon tidal water, and of an upper river dependent more or less upon the land waters?—Yes, I think it is a compound case. I would instance it in this way. If you were dependent in the Tyne entirely upon the land water, I doubt very much whether half the year you would not have the land water passing off through the Herd Sand by filtration instead of by a navigable channel. I know cases of that sort where considerable rivers are discharged by filtration.

4012. Would it be possible that you might have a very good navigable channel up to Newcastle, for the purposes of trade, existing with a very bad state of things at the bar?—It is possible that you might have a deep canal between Shields and Newcastle, and no definite sea entrance.

4013. I do not think it necessary to detain you further upon this report of 1851, as you say you adhere to every word of it. I think you were examined before the Tidal Harbour Commissioners in 1845, were you not?—Do you mean Mr. Hume's Commission?

4014. Yes.—Yes, I was summoned to attend.

4015 Have you looked lately at the evidence which you then gave?—No; not from that time to this.

4016. So far as you know, have you any reason to differ from the opinions which you then expressed?—No, none at all.

4017. I believe you were examined upon that occasion as to the constitution of the Commission in cases of this kind, were you not?—Yes; I believe I was.

(*Mr. Armstrong.*) The consitution of the Commission is regulated, and that is not a matter before us.

4018. (*Mr. Seymour.*) Are you aware that Mr. Walker recommended that the two piers, which appear upon his plan, should be built, and that the question as to whether or not inner piers were afterwards, required should be kept in abeyance until their operation was known?—No, I am not. I think this is the first time that I have seen this plan. I do not recollect seeing it before.

4019. Has your attention been called to this resolution of the 6th November 1851, at a meeting of the Commissioners at Newcastle? "Mr. Philipson moved, and was "seconded by Mr. Lowrey, that the short inner piers, laid down on Mr. Rendel's plan, be "omitted from the Parliamentary plan to be deposited, but that the Commissioners are "ready to execute an experimental short pier on the line of Mr. Rendel's plan on the "south side of the river, out of the general funds of the Commission, if it shall be found "requisite, after the completion of the outer piers; and if on such experiment being made, "it be found desirable, a similar pier be erected on the north side of the Narrows. Mr. Linskill moved as an amendment, and was seconded by Mr. Straker, that the two inner piers "or walls, recommended by Mr. Rendel, be included in the Parliamentary plan, which "amendment, on being put, was negatived on a division, there being for the amendment "two votes, viz., Mr. Linskill and Mr. Straker, and against it 12 votes, viz., Mr. Philipson, Mr. Ridley, Mr. Robinson, Mr. Dodds, Mr. Cowen, Mr. Lowrey, Mr. Hunter, "Mr. Lamb, Mr. Stevenson, Mr. Purdo, Mr. Carr, and Mr. Dunn. The original motion "was then put, and was carried on a show of hands." Has the fact come to your knowledge of the Commissioners of the Tyne, by a majority of 12 to 2, deciding upon adopting the suggestion of Mr. Walker, that the question as to inner piers should be left until the others were built?—I was not aware of it; but if they had been unanimous, I should have had the same opinion; and I beg at once to say, that if I had been consulted as to an experimental pier, I should have told them they might just as well put down an experimental pile at the Narrows. I hold it to be requisite to have a long line of guiding walls; and to put in a short length on one side seems to me like resorting to an experiment to prove a failure. I was not aware of it, certainly, or I should have objected.

4020. It is on both sides?—You have short guiding piers already, the sand banks; the good is to be effected by long guiding piers.

4021. When you speak of walls in relation to the piers, do you mean half-tide or full-tide walls?—Full-tide walls.

4022. Why do you say full-tide there?—Because I want to keep up a considerable and uniform velocity in the tidal column for its whole period of flood and ebb, and thereby increase the quantity of water passing up and down the river, as also deriving from it the greatest power.

J. M. Rendel, Esq.

8th February 1855.

4023. I believe you reported upon the works at the Belfast Lough in May 1845?—No; I do not recollect it, at all events; there is some mistake, I think. I do not recognize it by that name.

4024. It is so headed (*handing a document to the Witness*)?—It seems to be a report by me; but I do not recollect it at all. Do you mean the harbour of Belfast? If so, I have some recollection of a report I made relative to some railway scheme, I think.

4025. I will just call your attention to this passage: "It is a conviction upon my "mind, that to permanently secure a straight channel it must be, to some extent at least, "retained within banks more or less artificial, and that the more these banks are raised, "until as high as high-water spring tides, the better the channel will become; in other "words, that any scour which the channel now, or when embanked, can permanently "derive from such portion of the tidal water covering the slobs as may happen to be "brought into it by the branch creeks, is of little or any importance compared with the "good that would result from having banks that should fix the limits of the stream for "the whole period of the tide, and concentrate upon the navigable channel all the "agitation that is found to result from the use of it by shipping of all kinds, but steamers "especially. It appears beyond question, from Captain Beechey's observations, that "the tide would rise equally high, if not higher, at Belfast, and above the bridge, by "confining it within a properly formed channel through the slobs in question. A slight "increase of rise of tide in a port with so little flow is of great value to the navigation, "and in connexion with the better form of a channel for its passage, would be a most "valuable addition to the scour of its bed."—Yes. I adhere to that, because I now recollect that that is a totally different case from the Tyne. That is close to Belfast, at the harbour, and has nothing in the world to do with a long navigable channel with a bar at its sea outfall.

4026. Is not Belfast a tidal estuary?—Clearly. But it has no resemblance to the estuary of the Tyne. I will get you the charts of Belfast Lough, and show you that it is not.

4027. You have been asked some questions with regard to the Tynemouth Dock Bill. Are you aware that that was thrown out by the Committee of the House of Commons upon the evidence of the promoters?—Only by general report; really all I did upon the matter was to give evidence before Mr. Hawkshaw at the instance of Mr. Clayton.

4028. (*Mr. Webster.*) Mr. Calver appearing for them, and praying for delay, saying, "Postpone, postpone."

(*Mr. Rendel.*) I had nothing to do with it. I can give you no information upon it.

4029. (*Mr. Seymour.*) You have referred to the opinion of Mr. Rennie. My learned friend asked you the question whether you agreed with the opinion of Mr. Rennie as to his definition of half-tide walls; do you mean to say that you adopt my learned friend's question that Mr. Rennie does recommend half-tide walls?—No; and you will remember the way in which I gave my answer. I believe the difference is, that Mr. Rennie recommended half-tide groins, that is my impression.

4030. As connected with the influence of the current upon the bar, comparing the question of the quantity of water with the velocity of the water, which, in your opinion, is more important?—That which makes the greatest scour upon the bottom.

4031. Suppose that the effect of the works upon the Tyne is to reduce at Newcastle the low-water surface of the river, would you consider that evidence of improvement or not in the operations upon the navigation of the river?—Only so far as it goes. As far as Newcastle is concerned, whatever works depress low water and raise high water, or in other words, increase the column of tide, are evidence that improvement has been made.

4032. You said that, as a general principle, you were opposed to the abstraction of a quantity of tidal water from the river; may not that be, to a considerable extent, compensated by the increase of the momentum of the stream?—I say, as I said just now, that I would readily sacrifice a large quantity of tidal water, near the mouth of such a river, in order to get a comparatively small increase higher up the estuary.

4033. Then you probably agree in the opinion expressed by Mr. Walker in 1854. If a river depends upon land floods, then the abstraction of tidal water is of very little importance compared with the proper regulating of the stream?—I do not agree with Mr. Walker unless he states the whole of his conditions; let me know what the mouth of the river is,—let me know what the circumstances are. To tell me that you can stereotype engineering, is to tell me what is perfectly ridiculous; you might just as well stereotype portraits. Mr. Walker would not say so, as a general principle applicable to all cases, I am perfectly satisfied. I hope and trust that this will not be thought here contradicting Mr. Walker, because I dare say, if you were to write out the question, and state all the conditions of it, and send it to us both, you would get from us pretty nearly the same answer; but the answer must depend upon the statement of the question.

4034. My learned friend has asked you a question as to whether the works upon the river should commence at the mouth or higher up the river? I think you were examined, in 1849, before the Committee upon the River Tyne Conservancy Bill?—Yes; I believe I was.

4035. Was this the opinion expressed by you then, and do you agree with it now: "You can get no really permanent navigable channel until you have so altered the "shores as to confine the flood and ebb tides in the same course, and the sooner you

" could do that the sooner you would really know what amount of alteration ought to " take place at the harbour mouth "?—That must have been under some very special case.

4036. (*Mr. Armstrong.*) That was in reference to the Tyne?—I believe so. Reading detached passages from a long evidence is anything but satisfactory when truth is the object.

4037. (*Mr. Seymour.*) This is an examination by the Committee. " How could " you judge of your alterations in the river unless you commenced by straightening the " entrance, and widening the velocity of the tide?" " There are certain obvious things " you must do in the upper part of the river You can get no really permanent " navigable channel until you have so altered the shores as to confine the flood and " ebb-tides in the same course, and the sooner you could do that the sooner you would " really know what amount of alteration ought to take place at the harbour mouth."— " In the upper parts of the river "? Will you be kind enough to refer to what part of the river they were examining me about. If you will be kind enough to allow me to peruse that evidence, I have no doubt I can reconcile it. It is very manifest that this question has reference to some previous evidence given, and I should very much like to peruse it if you will permit me, because these contradictions in evidence are more often only apparent than real.

(*Mr. Armstrong.*) Look at it, and see whether it is any contradiction.

(*Mr. Seymour.*) I do not put it as a contradiction.

(*Mr. Rendel.*) I read this as an examination by the Committee, and the learned Counsel knows that the Committee examine upon some previous part of the evidence given by the witness at the instance of either the promoting or the opposing Counsel. This, evidently refers to some part of my previous evidence, and if you will be kind enough to lend it to me, I will see to what part of the evidence the question and answer refer.

(*Mr. Webster.*) It was with reference to the question of confining the flood and ebb tide in the same channel.

(*Mr. Rendel.*) I am very desirous that what I say before the Commission should be said with all due deliberation and care; something like a contradiction is attempted to be set up, or I should not have been asked the question. I see that this has been proposed by Mr. Brooks as a matter in which he fancies I am giving different evidence now from what I have given before. I ask as a favour to be allowed to see whether there is any inconsistency.

(*Mr. Seymour.*) I am responsible for it, and not Mr. Brooks.

(*Mr. Rendel.*) One thing, however, is clear, that whereas I was urged repeatedly by the Tyne Commissioners, between the period when they entrusted me with their confidence, and that when I made this report, to give them my opinion on questions of this kind, I declined doing so until I could go into the case as a whole, from Newcastle to the sea. Therefore, it is very unlikely that I should commit myself to an opinion of this sort, excepting with reference to some speciality, which I doubt not I shall find in the evidence.

4038. (*Mr. Seymour.*) You said, referring to the state of the Clyde, that everything goes up the Clyde by steam-tugs?—Most things, I said.

4039. I suppose you are aware that most things do so also in the Tyne?—But I take for granted, that one of your great objects in laying out so much money in the Tyne is, that fewer things may do so.

4040. But as far as regards the effect of steam-tugs upon the Clyde, the same thing applies there?—I take it for granted, there can he no difference of opinion among any of the gentlemen at this table, that inasmuch as steam-tugs are an expense, if you could make a good sailing channel, you would not go to the expense of steam-tugging.

4041. Are steam-tugs cheaper than sailing?—If a vessel can go up in one tide with her sails, certainly it must be cheaper than steam-tugging, that is only a question of degree. Generally speaking, sailors do not take a steam-tug, even when they ought; to tell me that they would do so if they could do without it, is contrary to my experience.

4042. You said that you might possibly have a deep channel between Shields and Newcastle, and no sea entrance. In your opinion, can Newcastle be in a good condition when Shields is in a bad one, as far as navigation goes?—No; but I think, as I have said before, that it is a marvel that with all the ability for business of north country gentlemen, there should be this eternal war between them, simply because they live at the two ends of the river. Since you have broached that subject, it really seems to me that neither party is fit to have charge of it. I think it is the most extraordinary thing, that a river second to few in commercial consequence should for so many years remain unimproved, from the circumstance that those so deeply interested cannot agree amongst themselves to accept the plans of a competent professional adviser.

4043. In your opinion, can you improve the river at Newcastle without advancing the interests of Shields?—Clearly not; and you cannot improve Shields without advancing the interests of Newcastle; but such unfortunately is the crook which has got into all parties down there, that they never will go straight to the object of general improvement.

4044. Have you had an opportunity since you were last here of examining the soundings?—I have.

J. M. Rendel, Esq.

8th February 1855.

4045. In one part of the river, I think you said that there was a deep channel? In that part of the evidence you alluded to the Durtwick Sands?—Yes.

4046. Do you speak from the result of your soundings that those are in existence now, or are you aware that they have been removed?—I speak with reference to the charts which you were kind enough to lend me yesterday. I have not had time to examine all these soundings, there are such a multitude of them. I will take them at the entrance, where I began. As I understand it, these red soundings refer to those last taken by Mr. Comrie. The result of the general run of them is, that there is a deepening strongly marked along the shore of the Herd Sand. You will find that in most of these soundings taken last year, for instance along here, it is 25 feet 11 inches in place of 24; you have 26 in place of 19, you have 25 in place of 18. All these soundings come closer to the sand. There is some degree of shoaling on the opposite side as you might have naturally expected from that state of things. The change is most marked when you get just inside the Narrows, and again here (*pointing to another part*) you observe that where in 1849 there were 29 feet (thatis just opposite to the Low Light), there are now only 23. Then again this swashway has accumulated; naturally it would be so, because as the stream of flood, tide has from the deepening of this shore been brought more along it, it tries to make its way through here, and forms a stronger eddy over the Insand, and the tide is therefore thrown more on the shore. Along here you find a considerable deepening as the consequence of the growth of the Insand. Here you have a very considerable deepening, and the deep channel is thrown again on this side, and these soundings (*referring to another part*) show a corresponding shoaling. I merely refer to these changes to show that until you regulate and direct the tide through the narrow channel, you cannot really obtain any fixity of channel over the Insand. Again the change in the Durtwick Sand is very marked indeed. because where in 1849 there was at high water 33 feet, there is now only 20 feet. These sands have also grown up, and that has deepened (*referring to another part*). What I say is this, that all these changes in so short a time are evidences of disease. If things were right these changes could not be; that point would not have grown up (*pointing to the soundings*), because here we have deeper water. These soundings are right or wrong, and in one instance the thing is so marked that there cannot be a question about it, because here in 1849 there were 33 feet, where there are now only 20; that is at the point of the Durtwick Sand; this point has come down towards the harbour's mouth 700 feet. I am not giving an opinion now, I am taking these depths and measures from the soundings.

4047. How much better is the navigable channel abreast of the Durtwick Sands?—What do you call navigable depth?

4048. The main available navigable channel.—A navigable channel may be 1,000 feet wide, but unless you define what you call navigable depth, you cannot determine from that fact that the channel is 1,000 feet wide for a vessel drawing, say 14 feet.

(*Mr. Brooks.*) Say 20 feet high water at spring tides.

(*Mr. Seymour.*) Is it improved or not in comparison with the soundings of 1849?—Nothing is an improvement that brings down Durtwick Sand. Nothing is an improvement in this harbour that brings down the Insand. If your channel is 1,000 feet wider now than then, it does not matter, as I said before, it is an evidence of disease, and you may talk about it between this and this time twelvemonth, if these sands are growing up towards the harbour's mouth, I do not care what is the increase in the width of the harbour, I say the state of the Durtwick and Insand are evidence that things are going wrong as regards this part of the river.

4049. As a fact, is the channel wider or not comparing it with the survey of 1849?—It is wider, but these banks are nearer to the entrance, and therefore though it is wider here (*pointing to another part*), that does not influence my judgment. I do not know what it is, I will measure it if you like, but if the Commissioners will permit me I would rather take that chart back with me and look it over again.

4050. (*Chairman.*) That is more satisfactory, because our object is that you should say distinctly one way or the other whether you consider that the Tyne, as a navigable river, has improved within the last five years, or not?—I agree in the proposition that what is the interest of Shields is the interest of Newcastle; but I cannot think it the interest of Shields to have the Insand growing up. I cannot think it the interest of Shields to have the Durtwick Sand growing up.

(*Chairman.*) Had you not better drop Shields and Newcastle altogether, and talk of the river as a navigable river, whether it is improved?

(*Mr. Webster.*) Only that there are two parties here, Sir, and you have had questions put with reference to both. My learned friend will use this hereafter, perhaps.

(*Mr. Seymour.*) Then, Sir, I shall have an opportunity of resuming that part of the examination.

(*Chairman.*) Certainly.

4051. (*Captain Fitzroy.*) Concurring, as I do, so fully in the whole of the opinions expressed by you, who have most kindly favoured us with your evidence, I only beg to ask for information upon one point. The Jarrow Slake and Hay Hole dock having been referred to, the Jarrow Slake having no boundary at all round it, no kind of rubble wall or any other wall round it, supposing the Hay Hole dock to be constructed with a half-tide wall, the condition of the two, as to the sand banks, would, it appears to me, be different. The water would wash over the Jarrow Slake, and, therefore, keep it in its

present state as it has remained for a period of many years; but a limit, an edge, as it were, being carried round the Hay Hole dock, to me it appears that there would be a tendency to silt up by degrees until the bank within had risen to the level of the wall. Am I correct in that supposition?—To a certain extent you are. I will draw the distinction. The Jarrow Slake has scarcely any current over it; of course, therefore, it has not the cleansing operation due to a stream sweeping over it. Hay Hole, made into a half-tide dock, would have, as it has at present, a current passing over its whole extent, as soon as the flood-tide covered its enclosure bank up to the time on the ebb when the tide had fallen below this bank. Now, as it is proved that Jarrow Slake, without a current of tide passing over its surface to keep it free from deposits or accumulations, presents no evidence of having silted up since Giles' survey of 1813, it is right to infer that, as its level is that of half tide, the water in this part of the river does not carry much sand or silt in suspension; or, in other words, that the sands moved by the stream in this part of the river do not float much, if at all, above half-tide level, and that their disturbance or travel mainly takes place in the first half of flood and last half of ebb tide. This being the case, I did not consider that silting up would go on at any considerable rate in such a half-tide dock, though it is reasonable to expect that, as more tidal water will pass over it than passes over Jarrow Slake, acre for acre, the shelter afforded by its partial enclosure would make any deposits of silt which the passing tides might be incapable of holding in suspension, less likely to be removed than similar deposits made on the unenclosed surface of Jarrow Slake; still, looking to this fact, that only a small portion of the whole surface of this half-tide dock would be wanted, or rather used, by vessels loading at the staiths, and that such space would be along the shore, that is, the present deep or navigable channel, I did not, nor do I now, see any difficulty in retaining such a deep channel, even if dredging should have to be resorted to occasionally. A channel 200 feet wide along the staiths is more than sufficient for the trade to them. The remainder of the dock might, without injury, silt up to the level of its half-tide enclosure bank. The plan was a compromise, and that without an undue sacrifice of tidal water. I considered more could not be done, pending the works at the entrance.

J. M. Rendel, Esq.

8th February 1855.

(*Mr. Webster.*) If Mr. Brooks will put in the additional matters, which he was to produce, I shall be perfectly content, on behalf of the minority, to leave the matter with Mr. Rendel as to your guidance.

(*Mr. Armstrong.*) We cannot consent to that.

(*Mr. Webster.*) If some course of that kind is not adopted, we shall be obliged to request the attendance of Mr. Calver, or some gentleman of that class of experience, to give his opinion upon these fresh soundings, and as to the facts which Mr. Brooks has to supply us with.

(*Chairman.*) The soundings are taken by Mr. Comrie, not by Mr. Brooks.

(*Mr. Brunel.*) As far as the parties are concerned whom Mr. Webster represents, surely they have closed their case, as far as any evidence is concerned.

(*Chairman.*) Yes.

(*Mr. Brunel.*) It is now evidence which the Commission is calling, and in which both parties have the advantage of examining the witnesses now called.

(*Mr. Webster.*) I am only reminding you, Sir, that Mr. Brooks has not finished his case.

(*Mr. Brooks.*) I have those matters ready.

(*Mr. Armstrong.*) Unless this further inquiry renders it unnecessary, it is better that all these matters should be collected to assist us, and, if necessary, that we or our secretary should go down.

(*Chairman.*) That was our idea. That, as these plans are very imperfect, they might be examined with much more facility, and that our secretary should go down and compare all the plans, and verify the results, and somebody on the other side would be present to see fair play.

(*Mr. Armstrong.*) Mr. Calver would take care of it.

(*Mr. Webster.*) I thought that even that, so far as I was concerned, might be almost unnecessary.

(*Mr. Brunel.*) What is the point?

(*Mr. Webster.*) Mr. Brooks has produced first his plan of 1845, as showing his river lines, which, he says, was the plan produced before the Commissioners at their meetings. I have asked for the area included within those walls, and the area of encroachments made into solid land, supposing his full-tide walls were carried out.

(*Mr. Armstrong.*) You mean the area of land abstracted from the tidal flow of the river?

(*Mr. Webster.*) Yes, Sir, upon certain lines.

(*Mr. Brunel.*) Has it reference to an inquiry of yours as to whether the Commissioners have been consistent or inconsistent, or anything of that sort; or has it reference to an inquiry as to whether the works have injured and will injure the river?

(*Mr. Webster.*) Both, Sir; but principally the latter.

(*Mr. Brunel.*) If it has any reference to an investigation upon which you can assist us in seeing whether the works which have been executed, without reference to whether they have been originally proposed or not, have injured the river, and continue to injure it, then, of course, it is valuable information.

(*Mr. Webster.*) I apprehend that the amount of abstraction of tidal water must be an important question to be brought before you.

J. M. Rendel, Esq.

8th February 1855.

(*Mr. Brunel.*) No doubt; but not a comparison between what has been executed and what was proposed to be executed in 1843.

(*Mr. Webster.*) No, Sir; the case is this, there never has been any river line settled.

(*Mr. Brunel.*) What have we to do with that

(*Mr. Seymour.*) If you will tell me specifically what is wanted, it shall be supplied.

(*Mr. Webster.*) It has been stated already, namely, that Mr. Brooks should furnish the area which would be abstracted.

(*Mr. Armstrong.*) The area of land which is now at high tides covered with water, and which would then be above high-water mark.

(*Mr. Webster.*) Yes, Sir, supposing Mr. Brooks' lines of of 1845, or his lines shown upon what he called the Commissioners' plan, should be adopted.

(*Mr. Armstrong.*) You say that supposing that is ultimately carried out, so much as is raised above high-water level will be so much abstracted; that is what you want.

(*Mr. Webster.*) And of course, Sir, the depth, so as to enable us to calculate it; the abstraction of tidal water is really the thing.

(*Mr. Brunel.*) The cubical contents.

(*Chairman.*) That is the more proper word, is it not.

(*Mr. Webster.*) Yes, Sir, the cubical contents.

(*Mr. Brunel, to Mr. Brooks.*) Have you already calculated that.

(*Mr. Brooks.*) No, Sir.

(*Captain Fitzroy.*) With reference to that question, any calculation made of the change in the cubical contents of the tidal water, should also be accompanied by the change made in the navigable channel of the river in depth at low water.

(*Mr. Brunel.*) This is not a question of any change which has taken place, it is a question of the cubical contents which will be abstracted by a certain plan.

(*Captain Fitzroy.*) That I am quite aware of. I say that any calculation of that kind should be accompanied by a general statement of the amount of cubical alteration in the navigable depth of water.

4052. (*Mr. Brunel, to Mr. Rendel.*) With reference to the management of the works upon the river, independently of those of the pier, in your opinion, looking at the diagram of the tidal wave up the river Tyne, and with your knowledge of the plan of the river, do you consider that a half-tide training wall, only leaving room for the tide to expand itself beyond it as between the Narrows and Bill Point, would tend to impede the progress of the tidal wave rather than to increase it, or not?—I think not. If by the construction of proper works at the entrance and at the Narrows you secure the early inset of the tide, you would secure, with half-tide guiding walls the young flood up to Bill Point in less than three quarters of an hour after the tide begins to make off Tynemouth Head. I do not think more than this could be done by any permissible contraction of the river within whole-tide walls, even omitting all consideration of the effects of loss of tidal back water on the sea entrance. But I would again state, (though I need hardly do so to you), that this is after all a question of compromise, but that the point first to be considered is, what quantity of tidal water is necessary to keep open a good sea entrance.

4053. Would the tidal wave after half tide, at all events be materially impeded or advanced by the training walls being above half tide?—Inasmuch as the half-tide walls would, up to half flood, and after half ebb, confine and direct the stream as completely as whole-tide walls, so far there could be no difference in their effect. Now although after half tide upon the flood, and to half tide upon the ebb, the tide would cover the half-tide walls, the stream would not be banded or thrown from side to side of the river as it is at present, by the whole-tide groins, but would still run the strongest and in the direction of the deepest water, that is, between the half-tide walls. What the difference in the velocity would be in the deep-water channel, if the walls were raised to whole-tide level, would mainly depend on whether the sea entrance would pass the requisite quantity of water to fill the larger reservoir due to the half-tide walls system, as compared with the reservoir due to the whole-tide wall system. If it did so, then I see no reason for supposing that the tide would flow so much higher in level as would in any degree compensate for the loss of water, due to the diminished area of the river, by the formation of whole tide in place of half-tide walls.

4054. But what do you say as to the tidal wave?—I do not think it would affect it at Newcastle.

4055. You think that the making of a complete closed trough or channel from the Narrows to Bill Point, would not materially increase the tidal wave beyond Bill Point, as compared to the effect of a half-tide training wall?—I do, always supposing that the bed of your channel has the inclination which the land floods will give to it.

4056. As to the average inclination of the bed, I observe that the average bed from Newcastle to below Jarrow Slake is as nearly as may be level?—Yes; and in my report you will find that I refer to the sands about Jarrow Slake, and consider them as a river bar, that will always require some dredging to enable the river to maintain its proper slope and outfall.

4057. As to the question of ascertaining the effects of works during the last four or five years, as an engineer do you see any way by which we can arrive at information upon that point but by the mere mechanical process of examining minutely and accurately all the soundings which have been made during those periods?—I do not, with reference to that

period; but as an engineer I know that five years is not enough to test a principle, or works of this nature, and therefore I think this is a case where we should be rather guided by experience, and by a reference to cases where nature works out and maintains a good navigation. Besides, if it is to be a matter of experiment, I want to see it carried out a little more fully. We do know this, that in the case of every groin which has ever been made in a navigable river, that the strong current produced at its head digs out a deep hole, and that it raises a bank in the eddy caused by such current,—a deep hole and a bank; we also know that these effects are increased as the height of the groin is increased. We likewise know there are cases where such groins greatly distort the stream and interfere with its momentum. The Dee, below Chester, is a case in point.

4058. Then I understand you to say, that in your opinion the actual results, unless probably they were very decided, of the works which have been executed principally during the last two or three years, and extending altogether over four or five years, would not be safe guides to form an opinion as to the future?—I think not, decidedly.

4059. Of course your answer would not apply to results which have been ascertained after an experience of 40 years?—Clearly not.

4060. Has anything occurred in the river Tyne? have any works been executed, and any results obtained within your knowledge, that would support what I may call your view of the case?—I do not know that there have. There have been some half-tide training walls made, I believe; so far as yet ascertained, the result is satisfactory.

4061. Does not the present state of the works on the Tyne rather approach more to the half-tide wall system than to the full-tide wall system?—You have some specimens of training walls, but I should say the chief works executed are on the whole-tide groin principle.

4062. I want you particularly to draw a distinction between groins and training walls In the early stage of the effect of a full-tide groin, as contrasted with a half-tide training wall, while the ground at the back is only silted up to the level of the half-tide training wall, it is to a certain extent, I understand, in the condition which you think the right condition, except that the tidal wave is checked by the full-tide groin; the ground is not yet filled up to the level of the full-tide groin?—There is a marked difference between the two. I suppose this sketch to represent the shores of a river; the object is to make a good navigable channel by cutting off these bends, and so straightening it; if to attain that object I run off high-tide groins from the shores, the several spaces between any two of them on the same shore becomes what has before been called a "bulb," hence the stream of tide becomes strong between the heads of the groins, and comparatively languid opposite the "bulbs." But in addition to this variable current in the intended line of channel, the tide, when it has acquired any strength, will heap up on the sides of such groins, causing reflex action at the stricture between their heads and give rise to cross currents; thus (*pointing to the sketch*); continuous half-tide walls, on the contrary, secure a uniform current in the channel between them, whilst they are uncovered, and when covered they do not cause reflex action or distort the current from the channel, though there may be some diminution in its velocity. The advantage of training walls, as compared with groins, is stronger still, when, as in this case, you must submit to curves in the channel, and consequently have to encounter the difficulties caused by not being able to keep the ebb stream in the same course as the flood. These are my reasons for preferring training walls to groins; and my reason for preferring, in this case, half-tide walls to whole-tide walls is, that I do not think it safe, so far as the entrance is concerned, to diminish to such an extent the tidal water.

4063. (*Mr Brooks, through the Chairman.*) May not these groins be considered as the scaffolding to form the new line of shore more economically than if they were not in their place?—I do not look at them as a scaffolding, and unless they are connected by guiding walls, I look at them as the means of coercing the current, and so force it to pass between their heads, and I cannot draw a distinction between what you call the scaffold and what I should call the permanent work.

4064. (*Mr. Brunel.*) I wish to drop the question of the full-tide groin, and to consider the two cases of ahalf-tide training wall and a full-tide training wall. The cross-groins at present constructed in the Tyne, we are informed, are only made as a process for arriving at a full-tide wall with full ground behind. It may be a less safe way of arriving at it, but it is alleged to be cheaper, and without going into the question of whether it may produce some mischief during the progress of the works, the question I wish to put is simply as between a full-tide training wall ultimately with solid ground between it and the shore, and a half-tide training wall, with freedom for the water to pass beyond it up to the high-water mark. I understood you to say just now that you were decidedly of opinion that the effect of the tidal wave would be, generally speaking, greater and more beneficial up such a river as the Tyne, with half-tide training walls and the free flow of the water, than with full-tide training walls, and a reduced amount of tidal water?—My opinion is that the result would be very nearly the same, as to the propagation of tidal water up the river. I do not think there would be much difference, but the advantage of half-tide walls would be, that you would by them attain all that you could desire in the way of propagating tidal water up the river without diminishing the quantity to an extent that might endanger the sea entrance of the river. I must repeat it is a compromise. In all these cases it should be so taken, and that which makes the safest compromise, reasonably attaining the object desired, seems to me the great end to be secured, in such a case of

J. M. Rendel, Esq.

8th February 1855.

engineering as this. I would, therefore, say again, I hold that anything which would so diminish the quantity of tidal water passing up the estuary of the Tyne as to leave its sea entrance in the smallest danger, is a bad system, because all agree that the entrance is the key to the port, and that if we can attain the same end as to works up the river by one means (at a smaller cost of tidal water) than we can by the other, it is clear that the half-tide walls is the best plan, although the execution of such a plan might take a longer period and some more inconveniences whilst in hand, than the whole-tide groins, as well as more expense. But neither their expense or inconvenience would approximate the cost of whole-tide groins as a "scaffolding" done now, added to a whole-tide wall to be built, when as a "scaffolding" it has done its work, namely, filled up the spaces between these groins.

4065. Have you made any calculation of the amount of tidal water that really would be abstracted by carrying up these walls to full tide, as compared to what would be abstracted by leaving them at half-tide?—There were some calculations, I think, in the appendix to my report. I have not looked the papers over, since they are so voluminous, but I think the abstraction was found to be very large. It was gone into very carefully. I directed Mr. Hepple to calculate the area of the then tidal limits, and the cubic contents of the water it contained at a high spring tide; also the area of a proper sailing channel, whether for half-tide or whole-tide walls; the difference between the two areas, giving the area of the portions of shore that would be embanked in the one case, and left open in the other. My recollection is that it would be about one-half by a mean depth of five feet.

4066. (*Captain Fitzroy.*) He gives all those particulars which you refer to most fully, and also various capacities with reference to the different sections and areas?—I believe he does, and I know that he is very accurate in his calculations.

(*Mr. Brunel.*) Probably I may ask those who are interested in the result of this question if they would find for me these calculations, namely, the cubical contents of the water contained between high-water mark and the probable shore, which would, under any circumstances, be formed after the half-tide walls had been in existence for some time. I do not think there have been such calculations.

(*Mr. Brooks.*) They have not been put in, because no mudding up was to take place at the back of the walls on Mr. Rendel's plan.

4067. (*Mr. Brunel, to Mr. Rendel.*) Do you think that after these half-tide training walls have been constructed and in operation for some time, the space at the back will remain so deep as it was?—No, certainly not "so deep."

4068. Do you think that, generally speaking, it will silt up to the level of the half-tide wall?—No. I think the bursting effect of the tide over the wall would always keep it lower than the wall. My impression at the time was this, that you might assume that taking the whole area, or rather the whole cubic capacity of the shores outside the channel, made between the half-tide walls, you might ultimately lose one-third part by silting—not more, because you will see by the sections that you have a larger capacity above half tide along those banks than you have below half tide. This ultimate loss would be more than made good by the removal of banks between the half-tide walls in the channel.

4069. If the silting up should form a general line of shore, stretching from the half-tide wall to the old high-water line, then upon an average, I suppose, half would be occupied by silt?—If it took up a uniform slope.

4070. Assuming that it was a straight line in the new case, and something like a straight line, or perhaps rather a hollow line, in the old case, then the actual silting up behind the half-tide wall would, upon such an hypothesis, occupy the amount of half the water?—No. Your sketch (*referring to Mr. Brunel's sketch*) is not a correct diagram of the shores of the Tyne, because it assumes that the slope of the shore at high-water mark dies out. Generally speaking, there are cliffs and shipping places on both shores, with a considerable rise of tide in front of them. My recollection is, that this is more like the form of the shore, and what it would become from the proposed half-tide walls (*describing the same*), and more particularly, as these openings proposed to be left in them would not only give the requisite facilities for vessels to get to the wharfs, which would be cut off by whole-tide walls, but would also promote a scour along the shore, and cause such a stream at the opening as would make and maintain a good channel up to the wharfs. I do not think there are any appearances in the Tyne to bear out the supposition you put.

4071. If there were no openings left for traders, do you think it would be so then?—Then the slope might adjust itself to the nature of the soil; if it were sand, it would take a slope of 9 or 10 to one, I dare say. But after all, it would be a question of exposure, of current, and a variety of other such causes.

4072. Would any material trade be able to be carried on if the wharfs should be valuable inside the half-tide wall?—I think so. Along the Flintshire shore of the river Dee very long channels of this kind are maintained across half-tide banks, much less favourably circumstanced; and other instances may be adduced. The ebb stream of tide flowing off half-tide banks, is the sole agent in many harbours of maintaining deep channels or gutways between such half-tide banks. Cases of that sort will be familiar to you. Here the half-tide wall would assist by confining the scour.

J. M. Rendel, Esq.

8th February 1855.

4073. As to the effect of the tides upon the mouth of the harbour, and the probable effect of piers such as have been proposed, you have laid down your view of what would be the operation of the tidal currents, but you have not applied it exactly, I think, to the proposed piers. In the first place, let me ask you this question, does the whole of the flood tide run from north to south across the mouth of the Tyne?—Very nearly, if not all.

4074. And the whole of the ebb pretty nearly the other way?—Yes, as soon as the Herd sands are up, it is very nearly a straight course.

4075. In your opinion, I gather that any projection from the south, whether natural or artificial, must be much greater than the projection from the north, in order to keep deep water into a harbour in that situation?—I should prefer it. I should carry it as far eastward as I could afford.

4076. But then, in your opinion, ought there or ought there not to be any north pier at the mouth?—I do not see the smallest necessity for a north pier in the present condition of the harbour; and if ever a north pier were built, it should only be simultaneously with the extension of the south pier, so as to keep the south pier beyond the north pier.

4077. What do you assume then to be the operation of the currents which form the bar? What eddy from what counter-currents do you assume takes place over that part?—I assume that the ebb tide, continuing after the flood tide has made, produces a strong eddy at the mouth of this harbour, and we know that wherever you have a strong eddy, the water carrying sand, you have a deposit.

4078. But is it the fact, that the ebb tide continues for any time and with any force after the flood begins to make?—I believe a considerable time, because, if you investigate the times of high and low water in the offing, you will find that there is a difference of upwards of two hours, I believe.

4079. Looking at the diagram of the tidal wave, and the levels at low water down the river Tyne, and beyond the bar, it would not appear that the ebb tide can make much down that part of the river, between the Narrows and the bar, after the flood has begun to make outside?—It is so; otherwise, if you look for a moment, this form (*pointing to the plan of the Herd sands and bar, and Spar Hawk*) could not arise.

4080. I want to know the fact?—It is a fact known to every man who sails a ship in and out of the Tyne. And this (*pointing again to the plan*) is a natural consequence.

4081. Do you know where we have any evidence of the operation of the tides there, and how long the ebb tide makes out from the Narrows to the bar, after the flood begins to make outside?—Mr. Rennie's large chart shows it. I would add, that I am so firmly impressed with the importance of these questions which Mr. Brunel is now putting, that I asked the Commissioners to employ Sir Edward Belcher, or some man of equal nautical experience and surveying ability, to investigate the whole matter afresh; and as I understood the only objection the Corporation had to my proposal was the expense that would attend it. The best existing evidence will be found on the large chart by Giles, in 1813, by which you will find that the ebb tide from this harbour is carried by the sea flood strongly to the south for a very considerable time before it begins to make into the harbour.

4082. Have you been out in a boat and ascertained the fact?—No, I have not. I have been out in a boat, but I have not ascertained the fact myself.

4083. Is there any possible document from which we can ascertain the time during which the water continues to ebb out from the Narrows to and beyond the bar (the bar itself being the point where the eddy we assume is formed), after the flood tide has made and produced a southerly current outside?—If you refer to the gauge books kept by poor Mr. Comrie for me in 1849, I think you will have your question answered. I think you will find in his gauge books, that whilst the tide was rising at his gauge in Tynemouth harbour it was ebbing at the Narrows.

4084. I am not talking of the rising. An eddy, of course, does not depend upon the rise and fall of the level of the water, though it may be indirectly caused by it, but the question is, in what direction are the particles of water flowing at a given time. I would ask you to banish from your mind, for the moment, your views and your theories, or mine. I wish to know whether there is any evidence to which we can refer, to show whether there is any period during which the water is flowing out of the river Tyne at the same time that the water is running from north to south across the mouth?—Yes, you have Comrie's own currents to show it; there is a very large chart of it.

4085. (*Mr. Clayton.*) Taken in 1813?—Yes.

4086. (*Mr. Brunel.*) Can you give me the names of the particular harbours down the north-east coast of England which would afford us examples of the comparative effect of a north projecting coast and a south projecting coast?—I would give you, as most familiar to myself, Montrose and Aberdeen, as having headlands on the south, and the Tay, like the Tyne, projecting on the north side.

4087. Perhaps you will mention at another time any others, if they occur to you, and you will have the goodness to try and recollect any cases, either on that coast, or on any other?—You had better take the same coast, because it is liable to the same winds, as well as currents of tide.

4088. I wish for any cases which would show the effect of a projection on one side or the other of the stream, combined with a continued current in one direction, each tide,

J. M. Rendel, Esq.

8th February 1855.

flood and ebb, taken separately?—The most marked case I know of, which is the opposite of the Tyne, is Montrose, that is very marked.

4089. I did not understand why the piers, as laid down on that plan, would, of necessity, in your opinion, make the channel more crooked than it is now, as between, the Narrows and the mouth?—For this reason. I here find piers with their heads approaching each other to within 1,000 feet, leaving that opening in the direct line of the stream of tide along the coast. That within these heads so placed, they curve one so much to the north, and the other so much to the south, that at a very small distance the width between them becomes three times that of the opening, and before they reach the shore on the Narrows, the width between them becomes five times the width of the entrance. If the stream of tide which is to fill the Tyne after these piers are built, continues to run from north to south, as at present, the stream, entering between the heads so placed, will not pass in a direct line towards the Narrows, but will sweep round by the north pier, and produce a corresponding eddy within the south pier-head, and thus, at or immediately within the pier-heads, sand would accumulate, and still further confuse and destroy the regular stream up to the Narrows. Again, the great difference in the widths of the space enclosed by these piers, as contrasted with the width between their heads, and with the river at the Narrows, would give rise to very variable velocities in the tidal stream, where it is of the utmost importance to its flow up the river that it should be made as uniform as other requirements, as, for instance, the in-run of the sea, will permit; such a state of currents will allow of such a capricious deposit of sand being brought within the piers, as will, it is probable, give rise to separate channels or swashways, and would make necessary in this part of the river, the same kind of works as are resorted to in the wide parts above Shields. If a good channel is to be maintained between the pier-heads and the Narrows, then I am quite sure it must be confined within parallel guiding walls, approximating each other from the entrance to the Narrows, so as to leave no more distance between them than will suffice to prevent the sea, which will pass in at the entrance, running past the Narrows, and into Shields Harbour.

(*Mr. Webster.*) I think, Sir, some of the information which Mr. Brunel was asking for, which Mr. Rendel said was upon the plan, will be found on the large chart of the two Giles' of 1813, which I do not think has been produced; we have not seen it.

(*Chairman.*) That is part of Mr. Rennie's survey.

(*Mr. Webster.*) Part of Mr. Rennie's survey. The one which you have seen, I am told, is a reduced one.

(*Mr. Brunel.*) Do you mean to say, that the currents will be shown in the manner that I want?

(*Mr. Webster.*) Yes, Sir, I understand so.

(*Captain Fitzroy.*) We saw the large chart at Newcastle, but it was impossible to bring it up.

Adjourned till to-morrow, at 12 o'clock.

Friday, 9th February 1855.

R. Stephenson, Esq., M.P.

9th February 1855.

(*Chairman.*) We have waited half an hour, but Mr. Webster is not here, and we thought it improper to detain Mr. Stephenson any longer.

ROBERT STEPHENSON, Esquire, M.P., sworn.

4090. (*Chairman.*) We have thought it right to call you more particularly for our own information and guidance; you were not summoned as a witness by either party. We wished to have your opinion upon the subject before us.—I shall be very happy to give any opinions which I have on the subject. I am afraid that they will not, perhaps, be in great detail in reference to the precise changes which have taken place in the Tyne recently, but still, on the general question, I shall be very glad to give my views.

4091. Have you surveyed the Tyne?—I have known the Tyne nearly all my life; I have never surveyed it; I know it very well.

4092. Your attention has been directed to its navigation, and to the best way of improving it?—Very frequently.

4093. You are aware of Mr. Rennie's plans?—Yes; they have passed through my hands once or twice; it is some years ago now.

4094. Do you approve of them as a general principle, subject to such modifications as time and circumstances may have subsequently suggested?—I think the views of Mr. Rennie generally were correct; they coincide in the main with my own.

4095. Are you aware of the present state of the river since those lines have been followed out as a guidance for the *resident* engineer?—I am aware generally of the alterations which have taken place. I have had the charts of Mr. Rennie, and a recent one made by Mr. Comrie, and I have compared the former state of the river with the changes that have been produced, I believe, by what has been done by Mr. Brooks, and I think the changes have been evidently beneficial.

4096. Have you examined the soundings previously taken, so as to be able to say from

R. Stephenson, Esq., M.P.

9th February 1855

your own knowledge whether a deepening of the river has taken place from the bar to Newcastle, generally speaking?—I have not made the soundings myself. I have examined the charts and soundings made by Mr. Comrie, I think in 1849 and 1854, and, having examined those two charts very carefully and compared the soundings with each other, I am of opinion that a very great improvement has taken place in the river; I think the channel has both been widened and deepened.

4097. You are aware of the different plans which have been proposed by Mr. Brooks?—I have examined them; I have seen a good deal of them. I know the spot so well, that it would be hardly worth my while going to the spot, but I have an opinion on the subject which I shall be glad to give you afterwards, though I am not prepared to give a strong opinion upon the question of the piers at the mouth of the river; it is rather a difficult question.

4098. We will leave you entirely at liberty as to giving opinions on Mr. Walker's plan; we will not press you to do so. Will you have the goodness to state whether you are aware of any encroachments on the tidal waters of the river by jetties, embankments, or other works?—Yes; I am acquainted generally with the encroachments. You refer to encroachments which are being made now by the engineer, in the shape of jetties?

4099. Exactly.—I quite approve of that plan of proceeding, provided, in addition, you employ tidal walls, so as to make a quay.

4100. Do you mean half tide or full tide?—Half-tide walls, perhaps, might be used in the beginning to aid in the silting up of the spaces, but my view of the action of the tidal water would certainly lead me to the opinion, that eventually a full-tide wall must be employed. If I may be allowed, I will explain my view. Having had my attention drawn to several rivers in this country, but more especially the river Nene and the river Ouse, I have studied them I think thoroughly, and the result has been in my mind to view the ingress of the mass of tidal water and its egress on the ebb as a simple mechanical problem. You must treat the flood tide as a given amount of mechanical force, urged from the sea up the channel of the river. Now, in all tidal rivers it is of course desirable that the tide should ascend inland as far as possible; with a view, therefore, of allowing the tidal wave or the flood to rise to the highest possible point, you must present to that mass of matter in motion as little obstruction as possible, and you must also contrive to maintain the velocity of that mass of matter as uniformly as the circumstances will admit. You ought therefore to avoid deflecting the current of the tide from one side of the river to the other; it ought, in point of fact, if it were possible, to go up a smooth straight channel; that would be the most perfect condition of a river possible. The wave or the flood tide being regarded as a simple amount of mechanical force which is to be expended, you must economise it by not allowing it to spread out into wide parts of the rivers; for as soon as it spreads out, a portion of the mechanical force which is given to the tide by the sea is abstracted from the tide, and consequently the momentum that remains is very much lessened, and it cannot therefore progress so rapidly or so far up the river as it would have done had a portion of it not been allowed, at every inlet, to become quiescent. In fact, a portion of the momentum or mechanical power is absorbed by every inequality of the channel, whether it is on the side of the river or whether it is at the bottom of the river; therefore you ought to make the bottom of the river as smooth and as uniform as possible; and for the same reason I think you ought to make the sides of the river as smooth and as straight as possible, in order that as little mechanical power shall be abstracted from the tidal wave as possible; that, therefore, brings me to the question of the half-tide walls. Up to half tide, the half-tidal walls would exactly answer the purpose which I have been explaining; that is to say, the flood tide up to half tide would be retained in as narrow and as straight a channel as possible, but as soon as ever the tide rose above those walls, then a certain amount of the momentum which ought to be confined to the channel would begin to expend itself in filling the inlets beyond the half-tide walls; therefore, if my original view be correct, that is an abstraction of momentum, and consequently it prevents the tide rising so rapidly or so high as it would do if retained up to high water in one uniform channel. All that reasoning, you will perceive, depends upon the proposition which I lay down, that it is simply a mechanical question, that you must regard it as a certain amount of force; you must keep that constantly in view, I think, in all the alterations made in a river, with a view to improve its regime. To me it seems so simple, not being able to detect any flaw in that position, that I believe you may reason with confidence upon it, and I think all minor questions that arise out of the complicated consideration of the question must be regarded as purely local; they do not interfere with the broad proposition which I lay down.

4101. I used the word "encroachment" because it is the word which is used in the Address to the House of Commons for the Inquiry, and which stands in our Commission. Will you have the goodness to explain whether you consider what the Queen's Commision to us calls an encroachment, an injurious encroachment or a beneficial one?—I think it it is the most direct mode of improving the river.

4102. Entertaining that opinion, do you think that the banks have not been injured, or is it your opinion that any injury has been done to the navigation of the river by jetties or embankments, by the expulsion of the tidal water, which has hitherto taken place in the Tyne?—Certainly not; I believe that there is no exclusion of tidal water.

4103. And arguing upon that principle, you would not think it injurious to the navi-

R. Stephenson, Esq., M.P.

9th February 1855.

gation of the river if the whole of Jarrow Slake, Coble Dean, and every inlet up which the tide flows at present remained stationary?—As those improvements go on, I am inclined to think that a considerably larger amount of tidal water will reach Newcastle than does now. That is the great question which we had before us in the Committee of the House of Commons during the recent investigation.

4104. You do not think then that jetties, embankments, or other works executed on the river have injured the navigation, or that they will continue to counteract any plans for removing the sand banks at the mouth of the river, or otherwise injure the navigation?—I think they will most decidedly improve the navigation. If you will allow me, I will state that the question was mooted most strongly in consequence of the Admiralty report being against the enclosure of the Jarrow Slake; it was resisted upon the fact that they supposed that it acted as backwater in scouring afterwards. Now, if the views which I have just thrown out and the opinions which I entertain upon that subject be at all correct I believe backwater under such circumstances to be most injurious to a river. Let us suppose for a moment that the Jarrow Slake is entirely excluded and enclosed by a full-tide wall; the quantity of mechanical power, as I said before, contained in the tidal wave instead of filling up the Jarrow Slake at that low level of the river, will be urged forward into a higher level of the river, and the consequence will be that the surface of the water at high tide will be a steeper inclined plane; the water that would have been left down at Jarrow Slake in a quiescent state, absorbing the force of the momentum which it originally contained, will be heaping up and raising the tidal water at Newcastle more. Therefore, when the tide begins to ebb, it will begin to ebb at a steeper gradient than it does now; it will therefore run down with a greater velocity. The tendency will be to equalize, as all improvements of rivers do tend, the period of ebb and flow. When a river is in a perfect condition or a wide estuary, the tide is very nearly equal both ways; if it has a rocky channel and is near the sea, we know that it is quite equal, but as you extend the river inland you then have the flood four hours and the ebb eight; I believe that is the fact at Newcastle, At present I think it is about four and eight; is it not, Mr. Brooks?

(*Mr. Brooks.*) About that.

(*Mr. Stephenson.*) The tendency of these improvements will probably be to make it five hours and seven. If you have, therefore, a larger quantity of water to discharge in an hour's less tide, the efficiency of that scour must be far greater than it is now; and just in proportion as the ebb tide is retarded, just in that proportion is the channel of the river bad.

4105. (*Chairman.*) Have you any improvements to suggest with respect to the management of the river by the Tyne Improvement Commissioners?—None whatever; I never meddled with that question at all.

4106. Can you give the Commissioners any opinion, or would you object to doing so with respect to the proposed piers at the entrance to the harbour?—I think I would rather not give an opinion upon that point. I have not, I think, given it sufficient attention; other engineers have devoted a good deal of time to it; therefore I would rather decline to speak upon it. I would say this, that in the proposal made by Mr. Rennie, many years ago, to continue the channel of the river as it were by a pier nearly parrallel with the present channel, he evidently had in view nothing but urging the scouring of the river to push the bar further out to sea; he did not in his scheme, I think, consider or perhaps did not give sufficient importance to the question of ships coming in there under a north-east gale.

4107. You allude to two parallel piers?—Yes.

4108. (*Mr. Armstrong.*) Mr. Rennie had only one pier?—Only one pier on the south side. He was evidently there repeating the results of Mr. Telford, or of himself in the Norfolk Estuary. The river Nene is a remarkable case, where improvements of a most marvellous character have taken place by confining the channel of the river between two full-tide walls, substituting straight walls pitched on the surface, or very nearly straight, and continuing them, instead of a portion of the river that used to meander through the sands of the Norfolk Estuary. They increased the depth, and they lowered low water at Wisbech something like 6 feet, I think, but it was some years in doing that. I have a plan here of the river Nene; I thought, perhaps, it might be interesting just to show an example. (*The witness produced the same and explained it to the Commissioners.*) Instead of this wide shallow channel they substituted this narrow channel between two high-tide walls. The ebb was checked by the friction of the water being spread over such an enormous area. By confining this large area they increased the hydraulic depth of the discharge; the consequence was, that the water got away in an hour or two less, and there being the same amount of water discharged, it was of course with a greater velocity. It became necessary to stop up the old channel. The old channel was loose sand which the water did not move during the ebb. This new channel was not deepened more than a few feet, and the Mayor and Corporation, as well as the inhabitants of Wisbech, fancied that by stopping up the old channel before the new one was completed, the town would be inundated; that the ebb would be checked. However, the engineers persisted in stopping it in spite of them, and succeeded in doing it by force. When they had turned the ebb into the new channel, I cannot state the precise time, but it was not many days before it had scoured away the channel some six or eight feet; and eventually this channel was scoured 16 feet deep, merely by the action of the tide. The effect there of substituting a

R. Stephenson, Esq., M.P.

9th February 1855.

straight confined deep channel instead of allowing the water to meander over the surface is very remarkable. The same thing has been repeated at Lynn by Sir John Rennie himself in the construction of a new cut, taking off a bend in the river Ouse below Lynn. The facts in that case may be stated thus: The Estuary widens out immediately below Lynn, as you see by this map, and the channel of the river was rather winding towards low water; at high water of course it spread over several miles in width. The length of channel between Lynn and a point called Herd Slice was about four miles by the old channel; the new cut which was made was about two miles. I am giving the approximate figures, they are very nearly correct. It was contended that the low water at Lynn would not be lowered by facilitating the discharge of the water by the substitution of a deep channel two miles in length instead of a wide shallow one, four miles long. The Report of the Admiralty was decidedly against it. They said that no depression would take place in the low water—that no improvement would be made in the navigation. The objects undertaken were both the improvement of the navigation and also the improvement of the outfall of the drainage of that fen country; the great object being, in all those fen countries, to make the river ebb as low as possible, so as to have the water discharged with as much freedom as possible. Now the effect was very much the same in a very short time; and by the last report which I had, which was last week, the low water at Lynn, in consequence of this work has been lowered 4 feet 6. The bed of the river is also deepened, but the level of low water is 4 feet 6 lower than it was, because it gets more rapidly away. The consequence is, that all this land which hitherto has been under great difficulty of drainage, has now 4 feet more fall than it had some years ago. The substitution of this narrow deep channel, instead of this irregular one, has also improved the navigation. Now these two cases, I think, are precisely similar to all the inlets that occur, not only on the river Tyne, but on every river; every irregularity, as I said before, whether it is on the side of the river in plan, or on the bottom of the river in section, affects the outfall of the water, and consequently raises the level of low-water mark at any point of the river. I conceive the importance of lowering the low water to be very great, because it lessens the resistance which the ebb makes to the flood in coming in. In addition to the friction on the sides of the river and the bottom, the flood tide of course is checked by the quantity of land water that is running out; therefore that is another source by which the momentum of the tidal wave is checked. That ought to be lessened as much as possible, and the lower you can get the low water, the less water you have pushed back by the flood-tide.

4109. (*Mr. Webster.*) I think you have made several reports on the outfall of the Nene, and also on the outfall of the Ouse from time to time?—I have.

4110. And those, in point of fact, embody the principles which you have referred to to-day?—Yes; mainly, I think.

(*Mr. Webster.*) I do not know Sir, whether you would think it foreign to the purpose to have copies of these reports. I know that they have been very instructive documents on previous inquiries.

(*Chairman.*) We intended to get some tracings to illustrate the evidence. Is it worth while to go into any great cross-examination? I suppose you will find Mr. Stephenson adhere to his opinions.

(*Mr. Webster.*) I was not going to doubt that, Sir, but to suggest to you that these were very important documents.

(*Mr. Stephenson.*) Those reports contain the substance.

4111. (*Mr. Webster.*) In the case of those rivers the great improvement was due to the mode in which the outfall was treated?—Certainly.

4112. I think it was part of the principle which you insisted upon in those cases, and to which the success is due, that you should so deal with the outfall that you increased the amount of tidal water entering?—Yes.

4113. Do you look to the tidal water in rivers of that kind as the element by which the channel is to be regulated, and the bar kept down?—Yes; certainly, in addition to the land water. A report, which I have just sent for, bears upon that question in rather an interesting way. I do not know that the tidal water acts a very important part. No doubt the volume of water moving backwards and forwards as tidal water is very great; and the velocity is also very great; and I have no doubt that the regime of the river, if you improve it properly, by confining it between two walls, will be good, and that it will keep the channel of the river in a healthy state; but it is very remarkable how long the same water is retained between the banks of all our tidal rivers. When I had the sewage of London brought before my attention, I had some experiments made by the late Mr. Foster, to ascertain at what rate the sewage of London made its way down to the sea. We put a raft into the Thames at particular points, and we kept a boat near to it for a month, which went up and down. We conceived that this raft which floated just at the surface would be a tolerably fair criterion of the mode in which the sewage would be dealt with by the tidal current. I found, very much to my surprise, although I might have anticipated it, that it went down (the rate depending upon whether it was neap tide or spring tide) about twelve miles I think in a spring tide, and it came back about eleven. The progress of the sewage therefore, or any matter put into the river Thames down towards Gravesend does not much exceed a mile a day. You observe that the same water is rocked backwards and forwards by

R. Stephenson, Esq., M.P.

9th February 1855.

the tide; it must therefore be moving the sand within the reach of the tide nearly backwards and forwards; it scarcely seems to progress much towards the sea. There would be no progress towards the sea supposing there was an equal ebb and flow every day, and no difference between neaps and springs. You must, therefore, be dependent entirely upon the difference between the ebb and the flood which must arise from the quantity of land water which you send down, and consequently it is the land water, I think, which moves the sand in a river down to the sea to form the bar. I think the tidal water itself can hardly be conceived to carry much towards the sea; for the action and re-action, if it were merely the tide, must be pretty nearly equal. Therefore, the progress of any matter down a river must be always, I think (I will not give a positive opinion upon it) from that reasoning, dependent upon the quantity of land water.

4114. You are now speaking of the rate at which matter, as for instance sand, at the bottom of a river, is moved down in its progress from the upper parts to the sea?—Precisely.

4115. I was directing your attention to this state of circumstances, to an estuary, or a river whose maintenance was due almost exclusively to tidal water, there being very little land water. Directing your attention to that state of things, I will ask you, whether under those circumstances it is not the column of tidal water and the amount of that which is admitted each tide, upon which its maintenance depends?—No doubt You must allow me to qualify that in some measure. It is not a mere question of quantity; it is the velocity as well.

4116. Take the case of the mouth of an estuary, so to speak, as for instance, the mouth of the Tyne, there the matter to be considered is the quantity coming in, and then in the upper reaches you look to the velocity as an important element?—Yes, I do.

4117. I think cases have come within your knowledge in which it would have been for the benefit of the lower channels of a river and an estuary if you could have excluded the land water altogether, and depended entirely upon the tidal water for its maintenance?—I do not remember that.

4118. Have not cases come within your knowledge in which the land waters have been positively prejudicial rather than otherwise, so far as regards maintaining the lower part of the estuary in a good state?—No; I confess I do not remember it; I think not. I have been just putting a position which would imply that I regard the land water as the chief source of progression.

4119. You have spoken in your answers to two or three questions back to the rate of progression at which sewage matter, or sand for instance, travels from the upper reaches of a river to the sea?—Yes.

4120. And you have said that that is extremely slow?—Yes.

4121. Being due of course to the excess of the power of the land water over the sea water?—Precisely.

4122. Let me take a case like Portsmouth harbour, where the land water is insignificant; I believe there are cases of that kind within your knowledge?—Yes.

4123. In such a case is not the maintenance of the state of the harbour or the outfall due entirely to the tidal water?—It must be.

4124. Assuming that, is not the object of an engineer in dealing with the mouth of such an estuary to increase the quantity of tidal water which is admitted each tide as much as possible?—I should say certainly.

4125. Applying your experience upon the Nene and the Ouse to that question, would not that be increased by straightening and directing as much as possible the channel of the water?—Yes; I think it would.

4126. I will put an instance to illustrate the case in point. Just look at that (*the Plan to Mr. Walker's Report*), which represents the mouth of the Tyne, with piers projecting out in that direction. We will leave the piers out of consideration at the present moment. Would it not be consistent with the experience which you have had upon the Nene and the Ouse, that the state of things at the narrows and at the bar, would be improved by confining to some extent the direction of the flood and the direction of the ebb, so as to make it flow in a true channel to the sea?—I have no doubt about it.

4127. Then would it be consistent with your experience, that if the mouth of the Tyne is to be improved, there should be some means taken to make the water take a true course?—It would improve the position of the bar.

4128. Assuming that there is considerable irregularity as regards the state of the sand banks and as regards the depths of the water, and that they are of a very shifting character, is that irregularity of channel evidence of an irregularity of in-going and out-going current?—Certainly. I suspect that the deposition of all the sand here is caused by these Narrows. The ebb does not get away freely enough, and the water is penned up, as it were, and it flows through here (*showing the same*), and, therefore, if this were made wider, the ebb would sink lower. As it is now, it stands some inches above low water at the bar. Therefore, so much of the momentum of the tidal wave that is coming in, is lost until it has raised the water there up to this point. The current of the in-coming tide is, therefore, checked longer than it ought to be, and it does not go out so fast as it should; consequently these sands become deposited, and that is the cause of the channel here being so bad. Now, if you were to improve the channel above,

and if you could, by possibility widen the Narrows, you would no longer have any sand there or any obstruction whatever.

4129. Treating this part, at all events for the present moment, as dependent upon tidal water in the way which I have illustrated by Portsmouth harbour, which is entirely dependent upon it—treating this as a case of tidal water which maintains that lower part of the estuary, is it a proper object of engineering so to direct that current, that you may have a true current instead of a devious one, both for the flood and the ebb?—No doubt.

4130. I think you gave evidence on the Yarrow Dock Bill in the House of Commons and the House of Lords, last Session?—Not in the House of Commons, but in the House of Lords.

4131. Was it part of the principles which you advocated then that the Jarrow Slake was to a certain extent a bulb upon the channel, and that, therefore, cutting it off would be an improvement in the general momentum of the column?—Yes, that the momentum would not be interrupted.

4132. Jarrow Slake, I think, was dry about half flood?—About half flood from half ebb.

4133. So that the operation of Jarrow Slake was to divert the momentum which would otherwise be directed up the channel?—Precisely.

4134. I apprehend that these are to a certain extent distinct questions; namely, the treatment of the water above the Narrows, so as to take it up to the highest part of the estuary, and the treatment of the Narrows, so as to admit the largest quantity of tidal water?—They may be separated, no doubt.

4135. Assume for a moment that you are dealing with an estuary dependent entirely upon tidal water, I understand you to say that the object of good engineering would be so to improve the entrance as to get in the largest quantity?—No doubt.

4136. Would that be in this particular case, for instance, or a case analogous to this, effected by so training the channel that the ebb and the flood should go in one course?—Beyond a doubt.

4137. Assuming a state of things like this (Mr. Walker's piers) with two piers projecting out like these, and this left as one large estuary without any inner works, what, in your opinion, as an engineer, would be the state of things upon this intermediate channel as compared to what it is at present?—It is exceedingly difficult to predict the precise consequences; but I do not think that they would improve the channel at all. It is a naval question.

4138. A harbour of refuge probably?—Vessels coming in in distress; but you have to consider not exactly what is the best mode of draining the country or of maintaining the channel; you must see whether ships can approach with something like safety.

4139. I apprehend that all these questions, in dealing with a river like the Tyne, of such immense importance, are to some extent compound questions?—No doubt they are.

4140. This, with piers and with nothing else, you would look upon rather as a harbour of refuge, than as a river work for improving the entrance to the Tyne.—I think so.

4141. Would it be proper to describe these two piers, viewing it merely as a question of tidal water admitted and let out, as artificial groins, and this as a species of stricture?—It would act as a stricture.

4142. Judging from your experience of works of this kind, would the effect of that be to cause a devious current. Of course, the water on the flood tide would be at a considerably higher level outside than in?—No doubt.

4143. Would the immediate effect of that be that the water would rush in through that which you say is a stricture, and disperse itself over the whole of this area?—Partially it would distribute itself, but still it would be directed in a straighter line, because, if you suppose the sea to be suddenly raised up there and this to be a trough, the line of the current, if directed in this direction, would rather improve the channel here. But as the tide flows from the north, as at present, suppose this taken away, the particles gather in and they rather beat against the Herd Sands. Therefore they are deflected again to the other side of the river, and probably that very inlet is occasioned by it; that requires more investigation to speak positively upon it. I merely suggest that. Therefore I am rather inclined to think that by those piers, although it causes a stricture no doubt, the current will be really more direct than it is now.

4144. I am dealing at the present moment with the question of the admission of water due to the external elevation, so to speak, of those piers?—Yes.

4145. And I ask you, the water which is entering being due to an elevation, so to speak, outside, of course there would be no direct current setting in in that case; it would not have received from the outside any determination of current?—No; but it would make itself a direction.

4146. Assuming these piers to be put down with no inner works, there would not be anything to confine the current or to prevent its flowing over the whole of the channel?—Certainly not.

4147. Of course the velocity of the water through the stricture would be diminished in proportion to the expanse over the area. I mean the velocity at any particular point?—No doubt, as an abstract question, it is right; but inasmuch as that which you have characterized as a stricture is so much larger than the stricture which already exists, I do not think that you must look upon that as likely to injuriously affect the river. If all

R. Stephenson, Esq., M.P.

9th February 1855.

other portions of the river had been wider than that entrance, then, I think, your argument would hold; but I do not think it will do so, circumstanced as this river is, this being about 600 feet wide and that about 1,100 (*pointing to the plan*), therefore the water would get in there nearly four times as rapidly as through here, therefore I do not think it would be fair to regard it as permanently acting as a stricture to the tidal water.

4148. There is a much larger section across the Herd Sand than at the entrance?—I cannot answer that question; the area does not begin to tell on the Herd Sands; they are not covered, I suppose, till three-quarter flood, therefore the channel is very much confined.

4149. During the first period of the flood the channel is very much confined?—Yes; as shewn there.

4150. Looking to the course of the flood in this locality, being from north to south, in your opinion, would the set of the flood-tide into the harbour be improved by the lengthening of the south pier?—It would be improved, as an abstract question, no doubt; you would catch so much of the momentum of the open tide in the sea; it would be reflected and pass up the river with a little more energy. The supposed advantage to be derived from that I think so small that you must regard the sea there as rising up as a great lake, rising up with scarcely any velocity at all. Then it begins to rush into the river; the momentum from that source is so large as compared with the momentum from the flow of the tide in the sea, that I think you must regard the tide as principally owing to the rush of water from the sea into the river.

4151. As to the simple rising?—As to the simple rising.

4152. Supposing piers of that sort to be put down, you would view this case when they were down as due to the simple head of water?—99 out of 100.

4153. The set of the tide being across the opening, of course it would be so?—Yes; it does not affect the tide much.

4154. Has your attention been called to the state of things as they exist in some other ports upon this coast; for instance at the mouth of the Dee and at Montrose?—No; I do not know it.

4155. Your attention has not been called to the cases upon this coast in which you have, so to speak, a south pier as a projecting headland rather than a north pier?—If it is a case of navigation, which I think must always be kept in view when you deal with piers projecting out in that way, you must consider how a ship can be manœuvred. Supposing she is coming in undersail from a north-east wind in distress. I think you ought to have the north pier there to the windward; the long pier I think ought to be to the windward.

4156. You view this position of these piers as a nautical question, with reference to a harbour of refuge?—I do.

4157. I wish for a moment to lay that consideration out of the question and to view the position of the piers entirely with reference to the effect upon the bar. As these are proposed, the bar is within them.—Yes.

4158. Has your attention been called to the peculiarities of the bars at Montrose and at some other places upon this coast, where you have the state of things existing here reversed, namely, instead of the headland being a projecting headland from the side on which the tide comes, the projecting headland is on the south?—On the east coast, as far as I remember, the Humber is a case like this, because the projection, Spurn Head, is on the north side of the mouth of the Humber, and therefore it affords a shelter in the same way.

4159. I was asking you specifically upon some of the harbours north of this. I think Mr. Rendel referred to Aberdeen and to Montrose and to the mouth of the Tay, in which the position of the headlands was either the same or exactly different to what it is here?—In the Tay I think they are about the same.

4160. Has your attention been called to the state of things at the bar, with regard to those places?—It has not.

4161. Looking to the question of peers and of entrances, there may be a different question with reference to the effect upon the bar and with reference to this as a harbour of refuge?—There may be a difference, I admit; in saying so I must not be considered as quite admitting that there will be. I have now the actual experiments that were made on the progress of the raft down the river.

4162.—Of course the state of things, as regards the transit of the raft and the translation of the mud from the upper part of the river to the lower, will depend upon the quantity of the land water?—A good deal, I think.

4163. And it will depend upon the relation which the quantity of land water bears in velocity or volume to the tidal water?—That is my view.

4164. Are you at all acquainted with the relative quantities of the land water and the tidal water in the Tyne?—I cannot say that I am; not in figures; I know that the proportion of fresh water is very large as compared with the tidal water.

4165. Do you mean much larger?—No. I do not say larger, but looking to the quantity of tidal water which comes in, the land water forms a very sensible portion of the whole.

4166. To what point have your observations been directed, at which you give that pro-

portion?—About Blaydon, about three or four miles above Newcastle; the tide runs up there. *R. Stephenson, Esq., M.P.*

4167. Of course, the tide is felt at Blaydon?—Yes. 9th February 1855.

4168. But in dealing with the question of the maintenance of the channels, whether by tidal water or by land water, you would not instance Blaydon as a place at which the channel was maintained by tidal water?—No, not altogether.

4169. In your opinion, would it be fair to draw a division in this river at about Bill Point or Jarrow Quay, as between what might be called the estuary and the upper channels?—I understand there is a marked difference in the progress of the tidal wave up to that point and afterwards.

4170. Having reference to the questions which I asked you before of estuaries maintained entirely by tidal water, so far as regards the lower part below Bill Point, would you consider the maintenance of that part as due rather to the tidal water, and of the upper part to the land water?—No. Looking at the great blot in the river Tyne, if I may so call it, which nature has made, it is the Narrows; that is the point which regulates the quantity of water going both in and out. You may separate, for the sake of analyzing the operation of the tidal wave, the district below Bill Point from that above Bill Point; no doubt there is a marked difference, and that might have been predicted, perhaps, because Bill Point is a narrow point; it is a very sharp curve, and it must check the momentum of the tide receding; therefore, I dare say the phenomena exhibited above Bill Point are very distinct from those exhibited below Bill Point.

4171. In your opinion is Bill Point one of the points which do materially affect the momentum of the tide?—I have always considered that for years.

4172. Then do you concur in the opinion of Mr. Rennie and Mr. Rendel, that that is a point which ought to have been cut off?—I think it very desirable.

4173. To turn again to the question of the tidal water, one of the greatest improvements in your opinion which could be affected upon this estuary, would be so dealing with the Narrows and its lower part as to increase the quantity of tidal water coming in?—Yes.

4174. Should you think that this might be dealt with in such a manner as to get five or six feet more upon the bar than at present?—There might be a good deal more, but it is out of the power of any one to specify how much.

4175. You have already described the state of this river as having a bottom of a very light silt, and a shifting light sand generally?—No, I have not described it as that, that is not my report; I have never written any report upon the Tyne; it may be Mr. Rendel's.

4176. In the House of Lords I asked you, "What is the nature of the silt in the channel "of the Tyne generally?" And you replied, "It is exceedingly light, and easily moved?" —Yes, I dare say I gave that answer.

4177. Having reference to this character of the bed of the river, and this silt which has been translated down, to which you have referred, should you anticipate that by a proper treatment of the Narrows and of the channel below, you might get a very increased depth upon the bar?—I think you would.

4178. Of course that would be a very great advantage?—No doubt.

4179. Both as regards the question of the admission of ships during a longer period of the tide, and as regards the increase of the tidal water?—No doubt. I am anxious that I should not be misunderstood there; you just now mentioned in the question certain improvements below the Narrows, and suggested that the bar might be improved. Now I think the best way of improving the bar is, to improve the channel of the river from the very top of the tide. I do not attach any greater importance to improvements which may be made in the channel below the Narrows, as compared with those above. I believe that those which would let the ebb water come rushing from Newcastle, would move that bar out a great many yards

4180. Probably you think that the Tyne ought to be treated on one comprehensive plan as a whole, with the view of improving it throughout the extent of the tidal range?—If unlimited means were placed at my command, I should recommend that.

4181. Would you not think the proper system of proceeding to be, to have some settled plan as regards the system of improvement, and then to follow it out to the extent of your means?—Yes, that I understand is what is going on now in the Tyne.

4182. From whom have you understood that?—I have understood for years that they were adopting the plan of jetties, with the intention afterwards of putting in longitudinal walls.

4183. I should be glad to know from whom you understood that there was any uniform system of this sort going on?—I have seen it myself, and I thought that it was uniform; there may be some little local differences, but I am not aware of them. I know the principle adopted by Mr. Brooks to be that of jetties to begin with, and ultimately longitudinal walls.

4184. Then am I to understand you to say that you approve of the principle of full-tide transverse jetties, as the first step in treating a river of this kind?—I think they require to be used with great discretion; they sometimes do a great deal of harm, unless they are placed with great judgment.

4185. Having reference to that which you have described as the great object, namely,

R. Stephenson, Esq., M.P.

9th February 1855.

improving the momentum of the ascending water, is not a parallel training wall a greatly superior conduit for the momentum than a transverse jetty?—It depends entirely upon circumstances. If you will allow me, I think, as a first step, the longitudinal wall will have little or no effect in confining the current, it will merely divide the current, and the current will still run on each side of it; you would not then reduce the water into a quiescent state, and the sediment therefore would not fall down. You might go on simultaneously with a longitudinal wall, and with a jetty; if you cannot go on simultaneously with them, then I think probably a jetty in the first instance is more desirable—I think the silting up would be more rapid. I look upon the space between every jetty as a minature Jarrow Slake that has already silted up, it already absorbs a certain amount of the force of the tide, and some of the water will be between the jetties, and so long as it remains between the jetties, they may be regarded as injurious, because they absorb momentum, and the jetties will not drive the tide, I think, much further up the the river; but as soon as ever you begin to put in the longitudinal walls, and confine the channel, then the tide will run along.

4186. Then so far as jetties per se are concerned, from their admitting of the expansion of the tide between them, you do not anticipate that they will improve the momentum of the water?—Not much.

4187. But in order to get the effect which you seek, namely, improving the momentum of the ascending column, they must be joined by longitudinal walls?—Exactly.

4188. Is it in your opinion of any consequence with reference to the question of excluding a quantity of tidal water, whether the walls are full-tide or half-tide?—As I said before, half-tide walls do not appear to me to answer the ultimate object in view, that is to say, they do not confine the channel of the river and make it uniform; they confine the current of water within a moderately good channel up to half tide, and then all the former objections which existed come into play; as soon as the tide rises over the wall, the wall has no effect.

4189. But up to half tide the half-tide training walls are quite sufficient?—Certainly.

4190. Then would the effect of such half-tide training walls be to lead to a considerable scouring of the bed of the river?—I think it would; they would not be so efficient as the others, because the greatest scour takes place about half tide, and just when the greatest scour is taking place, then the tide overflows them and the velocity is diminished.

4191. I presume you agree in the general principle that tidal water is not to be abstracted?—No; I proposed, in the very question which I mooted with the Admiralty in Jarrow Slake, to abstract tidal water.

4192. You agree in the general principle that if the effect of abstracting tidal water in the upper part of an estuary should be to diminish the quantity coming in over the bar, it would be injurious?—No doubt.

4193. It was in that sense that I was using an abstraction of tidal water?—You take the question for granted, that you can abstract; now my view is this, that if you narrow the channel, and take off all the bulbs along the river, you increase the quantity of tidal water which comes in; therefore, when the question is put to me of abstracting some tidal water from a high part of the river, as an abstract question, I cannot help saying that of course I object to abstracting it, but then I do not think it is possible to abstract it.

4194. You assume then that there will be the same quantity of water passing through what I will call the minimum section, for instance the Narrows?—Just so.

4195. All your answers, in denying that there can be abstraction, are founded upon the supposition that there will be the same quantity of water passing through whatever may be the minimum section in the lower part?—Yes; at least that, when I first gave my explanation, I said, "That more tidal water would go in after the improvements in "the river were made than goes in now." At present the water at Shields, or at the Narrows, has not got low water when it is low water at the bar, and, therefore, there is an inclined plane upon the surface of the water between the Narrows and the bar, which has to be overcome by a certain portion of the incoming flood, before the incoming flood begins to scour the river at all.

4196. You assume that the river may be so dealt with in the upper parts above the Narrows, that you will have more water through the Narrows than you had before?—Yes; because the water will fall lower.

4197. That of course will depend upon the extent to which the upper part of the river is narrowed?—No doubt.

4198. It might be narrowed to such an extent that you would have less water through the Narrows?—Certainly; I am always assuming in the improvements of the upper part of the river, that they should not narrow the channel preposterously; that they are, in fact, to keep in view what the natural section of the river is, and never to go below that.

4199. Therefore, in your assumption, that the same quantity of water will come into an existing minimum section at the Narrows, it is part of that assumption that the river shall not be improperly narrowed above?—Certainly.

4200. And in the evidence which you have given, as to the abstraction of water from Jarrow Slake as a bulb, and the cutting off of other bulbs, you assume that the water

which is abstracted from that area goes to the upper reaches?—That is not an assumption, it is a positive fact. We will represent the force of the wave coming in from the sea by, say, the No. 10; there is a certain amount of that force, No. 10, dropped in Jarrow Slake; there is a certain amount dropped elsewhere at present; but the No. 10 will come in.

4201. If I assume that the same quantity of water comes in through the minimum section, it must go higher up?—No doubt.

4202. Assuming that the same quantity of water comes in through what I have called the minimum section at the Narrows, it must go somewhere?—Yes.

4203. Therefore, upon that hypothesis, there is no objection to taking off Jarrow Slake, or taking off other bulbs, as you call them, which interfere with the momentum, so long as you do not narrow the river to such an extent as to produce a recoil which shall reduce the quantity coming through the Narrows?—Quite so.

4204. Of course the way in which the river is to be dealt with, and the narrowing which is to be permitted, becomes a question of calculation based upon the original or natural section?—Certainly.

4205. You are probably aware that Mr. Rennie proposed to reduce the surface of the channel of the river by about 448 acres less than at high water?—I do not remember.

4206. But the reduction which is to be permitted becomes a matter of precise calculation which ought to be laid down very accurately?—I presume it has been; it ought to be.

4207. And the opinions which you have given were founded upon the assumption that the sectional areas above should not be diminished to an extent which would be prejudicial?—Certainly; they ought not to be.

4208. You said, as I understand, before I came in, that you understood that the navigable channel of the river had been both deepened and widened?—Yes.

4209. From whom did you understand that?—I have had a chart made by Mr. Comrie for Mr. Rennie, I believe in former years, and the chart which he made in 1854, only a few months ago; they accurately represent, I believe, the condition of the river then and the condition of the river now.

4210. (*Mr. Armstong.*) And you find it improved?—I come to the opinion that it is greatly improved.

4211. (*Mr. Webster.*) Have you accurately traced the section so as to be able to say that the navigable channel, though deeper, is also wider?—I have measured the widths also; for instance, at Hebburn Quay, I found that not only was the depth increased about 2 feet, but that the contour line of 17 feet had become 19 feet, I think, very nearly. I can refer to it if you wish it.

4212. Are you not aware that it has been stated here by many witnesses, that although the navigable channel had deepened generally, yet that it was narrow?—I am not aware of that.

4213. The evidence which you are giving is derived from a comparison of the sections made at certain places upon Mr. Comrie's chart of 1813, and Mr. Comrie's chart of 1854?—Yes.

4214. Did you compare it with the chart of 1849?—I did.

4215. The general result which you look to as the one to be endeavoured to be attained, is the depressing of the low-water surface, and the raising of the high-water surface?—Yes.

4216. And in proportion as you can succeed in that, you get in a larger quantity of tidal water?—Undoubtedly.

4217. (*Mr. Seymour.*) In comparing the surveys and soundings, have you observed the state of the channel abreast of the Insand in Shields harbour?—Yes; I examined them throughout.

4218. Have you noticed the flood tide through the middle ground or the tail of the Insand, whether it has got shoaler?—It has got shoaler.

4219. Do you consider that evidence of the injurious result of the works, or of an improvement in respect of the channel?—It is an unquestionable improvement; the very water which went over that swashway before is now employed in improving the navagable channel of the river.

4220. You find that the navigable channel abreast of that place is improved?—Yes; it is.

4221. (*Mr. Armstrong.*) Is that from your observation, or from comparing the charts?—From comparing the charts.

4222. (*Mr. Webster.*) There is no doubt from the position, the alteration of the mooring of ships, and so on, that this has been changing constantly.

(*Mr. Stephenson.*) There is an accumulation, no doubt, at the Durtwick Sands, and I conceive that inasmuch as it closes up the swashway which a portion of the tide went over, in proportion as it silts up, it turns more water into the main channel of the river, and, consequently, in my opinion, improves it. It may possibly affect the question as one of landing places, or some local interest; but speaking of it as a navigation question, in proportion as that silts up, I believe that this channel will be improved. It cannot be otherwise, I think.

4223. (*Captain Fitzroy.*) Supposing the river improved in the manner referred to by

R. Stephenson, Esq., M.P.

9th February 1855.

yourself, by straightening and narrowing the channel, and looking to the occasional strength of freshes combining with the ebb-tide, and to their effect upon shipping anchored in various parts of the river, you would probably contemplate an increase of dock accommodation, with a view to obviate any danger from ice, or from very strong ebb-tides combining with freshes, injuring ships or driving them from their moorings?—I do not apprehend that the velocity of the current at any time will be so seriously increased as to occasion a danger to ships.

4224. We have had evidence before us of ships being driven out of Shields harbour, and carried from their moorings to a considerable distance within the harbour, by the combined effect of heavy freshes, ebb-tides, and ice. The number of ships in Shields harbour increases yearly. There have been during the last year, on the average, 200 or 300 more on each side of the entrance of the Tyne than used to lie there in former years. Looking to that increase, and probably a still greater increase, would it not be advisable to increase the dock accommodation in the river as much as may be practicable?—I have always advocated the formation of docks in the river very strongly for the last twelve years, and I think it is the universal opinion amongst those who are acquainted with the trade of the Tyne.

4225. Then the objection which has been urged occasionally to the bonâ fide improvement of the river, as a navigable channel from the entrance to Newcastle, on the ground of the current being so much strengthened as to be injurious to the shipping lying in the river, has no real foundation?—Not in my estimation.

4226. Looking to the rather difficult and complicated action of the tide upon the mouth of the Tyne, and referring for a moment to the way in which the great tide-wave acts upon the British Islands taken as a whole, the great tide-wave in the ocean being, of course, a mere vertical movement, and not a horizontal one, as that wave passes along the shore to the westward of the British Islands, taken as a whole, it causes derivative waves, which are more or less horizontal movement of the water as they near the shore?—Yes.

4227. Following the course of those derivative waves, the tide which comes round Tynemouth Head and affects the mouth of the Tyne, will be more or less a horizontal movement of the water, as well as a vertical rising, will it not?—Undoubtedly.

4228. Then the action upon the mouth of the river will be a combination of both, that is to say, there will be a tidal impulse derived from the horizontal movement of the water, and also the impulse arising from the higher level of the water outside the mouth than the level inside?—Certainly.

4229. As the water moves along the shore from north to south opposite the Tyne, the impulse of the tides, taking the two kinds together, will not be so great as that in the Bristol Channel at the mouth of the Severn, where the tide acts in the same direction as the river, instead of passing across the mouth of it?—I quite coincide in that view.

4230. The action of the tidal wave opposite the mouth of the Tyne, being across the mouth, and in the Severn in the direction of the mouth, the effect of raising the water in the river will be different in the two cases, although of the same nature?—No doubt the same nature, but different in extent.

4231. The more the course of the river corresponds with the direct impulse of the flowing tide, the greater, generally speaking, cæteris paribus, will be the rise of the water in that river?—No doubt. You have drawn my attention to the Severn. The mouth of the Severn is very wide, as well as presenting itself to the immediate and direct impulse of the great tidal wave. But the great rise in the Severn, I think, is not owing to its receiving the direct impulse of the great tidal wave from the Western Ocean, but it is owing chiefly to its peculiar form; it is excessively wide, and it goes on narrowing like a trumpet. Now, that is a case where my mechanical mode of viewing it comes into play. For instance, suppose the mouth of the Severn to be at a point where it is five miles wide, and say ten feet deep, the water comes from the ocean with a certain velocity. Now these, the *vis vivida*, to use the term used by mathematicians, or the momentum, is spread over the five miles. When it gets further up the river, it gets contracted, but there is the same amount of momentum, minus the friction, which it has incurred in travelling over the sand. Then the momentum being the same where the river is 2½ miles wide, in place of being five, instead of ten feet deep it would be twenty feet deep, and hence, in that river, the water rises far above the tidal wave.

4232. But in the Tyne, is it not the fact, that the water does not rise in any part of the river above the horizontal level taken from the Narrows up to Newcastle Bridge?—That is the fact, I believe.

4233. The results, therefore, of the combined action, be they what they may, are quite different in the Severn and in the Tyne?—Quite different.

4234. I find by the charts that the stream of tide runs past Tynemouth Head while the water is rising some time before it begins to flow up the harbour. There is a difference. Sailors call it tide and half tide, tide and quarter tide, and so on; but the effect is, that the stream outside in the offing is progressing in one direction while the stream from the harbour is running in another?—Doubtless.

4235. The chart says that the current under Tynemouth Head begins to run in over the Black Middens one hour after the tide begins to rise?—Yes.

4236. The vertical movement of the water under Tynemouth Head taking place an hour before any effect is found in the stream flowing into the mouth?—Yes.

R. Stephenson, Esq., M.P.

9th February 1855.

4237. I would ask you whether, in your opinion, assuming the facts stated on the chart to be correct, during that hour the water between the Black Middens and the Narrows is stationary, or had any horizontal movement?—You would have to ascertain a fact. I could not give an answer to that question, but I think, probably from knowing some facts, that it does remain quiescent. That the lift of the tide does not begin, probably, to operate upon the channel of the river above the Narrows, or at the Narrows, because the low water of the Narrows is never so low as the low water on the bar; therefore, there is always a current which has to be checked by the lift of the tide; and just by about the time (probably an hour) that the lifting of the tide has overcome that, then the other current comes in over the Black Middens. I suspect that to be about the fact.

4238. Then at that time, the water being quiescent within that space, whatever silt that water contains, whatever it may have brought down in suspension, will, probably, according to the general nature of such matters, be more or less deposited?—That I believe to be the true cause of the bar.

4239. I see on the chart that near the Herd Buoy, near the extremity of the Herd Sand, the water begins to set over that sand towards the harbour three hours after the stream of flood tide has made in the offing; that is, that the flow of the tide has been going along shore in the offing three hours before it begins to make over the Herd Sand. Before that water begins to make upwards over the Herd Sand, and while the water is quiescent on the north side, what is the stream of the river doing in the Narrows?—Are you speaking of after ebb or after flood?

4240. I mean after the ebb; my object being to ascertain, from the data which the charts give us, how long the ebb stream continues to run through the Narrows after the flow of the tide in the offing has set to the southward, and has begun to rise; because the charts show that the two are nearly coincident in the offing; that the water sets to the southward when it begins to rise. The charts show that the stream inwards, taking the different lines which are marked, begins to set towards the Narrows, at times varying from one hour to three hours. During those times I should feel anxious to know what the course of the water in the Narrows is. The chart does not show that?—I apprehend (it is only an opinion) that the current will be upwards through the Narrows at that time.

4241. But stationary at the Black Middens, and, of course, not running over the Herd Sand, because the Herd Sand is then dry?—Yes; the Herd Sands are not covered at that time: three hours, I think.

4242. The pilots say that the ebb tide runs out of the Narrows from two to three hours after the flood begins in the offing. It is what they call tide and half tide?—Yes; that is owing to the ebb tide not getting a free exit. It is dammed up in the river by the Narrows, and, therefore, some time after the flood tide begins to make, the water is still running from Shields through the Narrows. I do not know how long, but there is a difference.

4243. It is still running out, but rising?—Yes; clearly showing that the ebb tide there is affected by a stricture.

4244. Looking to the general question for a moment, supposing that the tide-wave passes along any coast in which there are a number of inlets at right angles to that wave running up a considerable distance, high water in those inlets, far up, at all events, will not be coincident with the high water outside?—No.

4245. They will be all derived tides, which will vary?—Clearly.

4246. However that might affect the tide within the Tyne, it would not affect the tide at the mouth. High water at the mouth ought to coincide with the crest of the wave passing the mouth of the Tyne?—Undoubtedly; but the sympathy between the tide in the upper part of the river and the tide at the bar is very much affected by the existence of the Narrows between them. When it is low water upon the bar it is not low water at Shields; therefore, it continues to run out from Shields through the Narrows for some time after low water has taken place upon the bar, and some time after the flood has begun; until, in fact, the flood has neutralised the inclined plane between Shields and the bar, there is no upward progress in the water.

4247. When the fresh and salt water meet, does the salt water force its way under the fresh, or do they take sides, as it were, or mix?—That, I apprehend, would depend entirely upon the form of the channel. If it is in a regular channel they must evidently mix, the same as a current of water coming out of a great river into the ocean.

4248. The specific gravity of the two, being so very different, would not be a sufficient cause to ensure the sea acting as a wedge?—I think not. To some extent it must be so; but I do not believe in a wedge of water to any extent.

4249. There is a mixture?—There must be a mixture, and very rapidly too.

4250. But it is the case in some rivers that the upper stratum of water is fresh while the under stratum is salt?—That is rather from the fresh water flowing on the back of the salt, than the salt pushing itself under the fresh. I do not believe in the salt pushing itself under the fresh, but the fresh runs over the salt—that is a very different thing.

4251. Referring for one moment to the progress of matter down a river, is it correct to suppose that the greater part of the sewage, or the detritus carried down a river must

R. Stephenson, Esq., M.P.

9th February 1855.

eventually be carried to the sea, as otherwise the river would silt up?—Yes, it gets into the sea at last; but I think that the detritus which is brought down from the higher portions of the country is very much over-rated. I think it is very small. I think it is employed very often in raising the beds of the tributary streams themselves. I think, that if all the detritus put into the upper parts of the river were really brought down into the harbour the river would soon be rendered impassable.

4252. Then the result of the whole, however long it may be in progress, must be that the greater part of the detritus of a river is carried to sea in the course of ages?—No doubt.

4253. (*Mr. Brunel.*) From your evidence, as it stands at present, I think it would appear as if it were your opinion that the amount of tidal wave or of momentum which would be partially felt in the river Tyne, would not be much affected by the position of the orifice, if I may use the term, through which the water is admitted at the mouth of that river; and I wish to put it to you in another way, to see whether I understood exactly your opinion upon it. Assuming the facts which we are all familiar with, that the tide flows from north to south directly along this coast and across the mouths of the rivers on this coast, and that very soon after flood there is a velocity say of one and very soon two knots an hour, will or will not the momentum of the wave entering the mouth of a river there—not a bell mouth such as the Severn, but we will suppose a parallel mouth—be materially affected by the circumstance of whether the original momentum of one or two knots an hour is preserved or totally lost, and will it not be either preserved or totally lost under the two cases of receiving the water in the direction which it originally had in the one case, and merely receiving it at right angles to its course in the other?—I adhere to the answer which I gave before. I stated then that I thought that the momentum of the impulse derivable from the tidal current along the ocean, from north to south, was not great as compared with the impulse which the tide going into the river receives from the lift from the ocean, and I put it in this way: the lift of the tide is, say, about 15 feet in round numbers, a knot and a half an hour would be equivalent to a head (because that is, I think, the mode in which I put it,) of not more than about three inches. Supposing the current came across the ocean, and went right over the bar without going at right angles, and supposing the great tidal wave was a wave of translation at the same time, a knot and a half an hour (I speak merely from mental calculation just now) would not increase the tide more than about three inches; that is taking the full advantage of the tidal translation, as compared with the full lift of the great tidal wave; and I think they may be compared to each other in that way. I think it a fair way of putting it.

4254. Assuming what I believe is the fact, that at present the velocity of the water in the river, just within the Narrows is, say, three knots an hour, and that outside the water was originally running at two knots, the head of wave that you refer to as producing the velocity, apparently produces, in addition to the original momentum of the water, only a velocity of three knots an hour?—Yes.

4255. And that is the united effect of the rise of water outside the bar, and the original momentum of the water, whatever that may be. The head of water necessary to produce a velocity of three knots is very small?—Very small.

4256. If our last calculation was correct it would bring it to a foot?—Yes.

4257. And that is the united effect of the wave and the original velocity of the water; therefore will not that original velocity, which is two thirds of the ultimate velocity, be a considerable ingredient in the velocity?—Looking at the sources of the two things, I really do not think so. The one is velocity derived entirely from an absolute column of water from the lift of the ocean, that is a positive ascertained fact. You have to consider what the effect of the other will be, moving nearly at right angles to the velocity which is created by the tidal wave. Therefore any other velocity at right angles can hardly be supposed to add to the velocity of the former, because any two forces, the one at right angles with the other, have no effect upon each other. Therefore, unless you put a pier projecting on the south side, I think you get no advantage at present. Then the question is, when you put a pier there, what advantage will you get? It is a somewhat complicated question, and that is a mode which has presented itself to my mind in considering it.

4258. My questions were directed to the comparison between an orifice exactly at right angles to the current of the water, and a trumpet-mouth formed by a projecting south pier. I was comparing those two extreme cases.—Yes. Then I think there would be an addition given to the tide by the south pier, but I will not venture after the doubt which has been raised by Mr. Brunel, to state that I have any great confidence in the view which I have thrown out as a mode of comparing them. It appears to me that it is right at present. I think so. However, that is a question which I cannot positively answer.

4259. (*Mr. Brunel.*) I should wish to say that I concur perfectly with Mr. Stephenson in his mode of viewing the cause of the tidal wave up any branch from the ocean. I was only going a little into the actual amount, on which I differed rather from what I understood Mr. Stephenson to give in answer to a former question; but it appears that my hypothesis was in the extreme case of comparing an orifice at right angles with the current, and an orifice intentionally placed obliquely to it.

(*Mr. Stephenson.*) I still think that there is not much advantage derived in the quantity

of water poured into a river during the rise of the tide by the coast current. I do not think it is much. *R. Stephenson, Esq. M.P.*

4260. (*Captain Fitzroy.*) You have already referred, I think, to the shelter of shipping or the facility of access to the harbour as a nautical point to be considered in any piers that may be built. It is not a question of the movement of water, and the improvement of navigation, but of course the facility of access during the winter, and shelter from a north-east or easterly sea must also be kept in view.—Yes. I think the pier question resolves itself into a purely naval one almost. 9th February 1855.

4261. It is mixed up?—Here, I think, it is not much mixed up.

4262. (*Mr. Webster, through the Chairman.*) I understand you to say that in the present state of things in the Tyne, so far as regards the entrance of the tide, you view it simply as a question of head and pressure?—Yes, there is a slight translation of water.

4263. You say that, in point of fact, the current up the Tyne is due simply to head?—Yes.

4264. And that there is at present nothing at all analogous to the heaping up due to change of form which takes place in the Severn?—Certainly not, they are two very different rivers.

4265. Nothing like that now takes place in the Tyne?—Certainly not. The result is, that the water does not rise in any part of the river, as Captain Fitzroy said, above the sea, but in the Severn it rises 30 feet above the sea.

4266. In the Severn there is an elevation of tide due to the contraction, and the change of form which the water experiences by contraction?—Certainly.

4267. But there is no such elevation of tide in the Tyne arising from change of form of the water?—Inasmuch as all rivers rather contract as they go up; you cannot deny that there is some contraction.

4268. I am speaking of below the Narrows?—There must be something; it is very small.

(*Chairman.*) We have communicated with Mr. Walker, whose evidence we thought of taking; but he has sent word that he does not wish to interfere at all upon the subject; we, therefore, do not propose to examine him.

(*Mr. Stephenson.*) Mr. Webster has succeeded in recalling to my recollection a statement which I made, in reference to the effect of land water in tidal rivers. I did say, in the examination which took place in the House of Commons or the House of Lords about the Nene, that there were some estuaries or tidal rivers which I thought, if the land waters were entirely abstracted from them, would be in a better condition.

4269. (*Mr. Brunel.*) Will you explain what sort of cases those are?—I believe the river Nene especially brings down a large quantity of mud. It comes through a long level country—a fen country, and it ploughs up the peat, and brings a great deal of rubbish down, which is a great nuisance to the tidal part of the river; there is very little current.

Adjourned to Monday next, at 11 o'clock.

Monday, 12th February 1855.

12th Feb. 1855.

(*Mr. Macartney.*) HAVING been connected with the Tyne, and the promotion of docks in the lower part, I wish to tender myself as evidence in some matters connected with the Tyne, either to-day or to-morrow.

(*Chairman.*) On which side do you wish to appear?

(*Mr. Macartney.*) For having the improvements in the lower part of the Tyne done with the best effect. I was the chairman for the promotion of docks at Tynemouth, which, by the interference, I conceive, of the Newcastle Corporation, were thrown over, most unjustifiably, before a Committee of the House of Commons. I moved for certain papers, and put certain questions with respect to the Tyne River, particularly as to Messrs. Palmer's encroachment; the answer given to me originally appeared satisfactory, but the result is quite different from that which was given, and it has been the subject of complaint in Parliament recently.

(*Mr. Webster.*) Mr. Macartney has been concerned in some of these Tyne questions, upon which evidence, to a certain extent, has been already received, and upon which, I think, there is some little discrepancy on the notes. But, Sir, besides that, I should have to apply to you formally with respect to the correspondence with the Admiralty, and the correspondence generally. There has been, certainly, considerable confusion as to what correspondence is in and what correspondence is not in; and it will be, therefore, my duty to apply to you, when Mr. Clayton and Mr. Seymour are here, that that correspondence may be put in formally before you.

(*Chairman.*) As Mr. Rendel's time is precious, and as Mr. Seymour and Mr. Clayton have not come, had we not better suspend all other business?

(*Mr. Macartney.*) I merely asked the question, because it would be convenient to me, if you did not intend to examine me, to go away; or if you did intend to examine me, to come at such an hour as you would hear me.

12th Feb. 1855.

(*Chairman.*) You do not appear before us in any way, and unless one party or the other applies, we cannot examine you.

(*Mr. Webster.*) I should apply, Sir, for you to examine Mr. Macartney.

(*Chairman.*) I do not think we shall be very long with Mr. Rendel; my questions will be very few, and I do not expect that Mr. Webster will examine him at any length.

(*Mr. Mather.*) The examination of Mr. Rendel is considered so important by the Commissioners of the Tyne, that I respectfully submit to you to fill up the time of the Commission for a few minutes, until the arrival of our counsel.

(*Chairman.*) When we have fixed 11 o'clock, and Mr. Rendel has come and tells us that he wants to go away, how can we postpone his examination?

(*Mr. Rendel.*) I will remove the difficulty at once, Sir. I certainly should have requested you, if Mr. Mather had not mentioned it, to have suspended anything which I have to say in the way of explanation upon those questions, which Mr. Seymour put to me, implying contradictions, until Mr. Seymour comes.

(*Mr. Webster.*) At present, I understand that Mr. Rendel comes to give a sort of general statement upon your questions, Sir.

(*Chairman.*) I will examine him myself.

JAMES MEADOWS RENDEL, Esquire, further examined.

J. M. Rendel, Esq.

(*Mr. Rendel.*) I will now, Sir, with your permission, show you why I quoted, in reasoning as I did in reference to the way in which the tide enters the Tyne, the river Tay, as also the harbours of Montrose and Aberdeen. I produce first an Admiralty chart of the mouth of the Tay. It singularly illustrates all the tidal phenomena and formations which we have at the Tyne. You will observe that the northern land at the entrance projects considerably beyond the southern land, as is the case in the Tyne; what is here called the Buddon Ness, is in effect the Tynemouth Head. We see growing off from that "Ness" a sand, called the Gaa Sand, and that it extends for a very considerable distance eastward, in the form of a horn; the point of the horn over-lapping the entrance to the river. We see on the opposite or southern side, a large flat tract of sand, with its eastern end like the eastern end of the Gaa Sand, submerged, but having its western half above low water; this is called Abertay Sand. Now the eastern point of that sand grows up not quite so far east as the point of the Gaa Sand, but very nearly so, and we see that that part of the Abertay Sand, which resembles in form and position the Herd Sand, has all the swashways and peculiarities of the Herd Sand. The tide enters the Tay in the same way as it enters the Tyne; young flood overruns the mouth, and having attained a head or statical pressure, it enters the channel inside the bar as an eddy stream or "wheel" over the Abertay Sand, in the same manner as the tide passes into the Tyne over the Herd Sand. The consequence is, that we have between the extreme, or say three fathoms soundings at the heads of these two sand-banks, a sea bar, on which there are from 21 to 22 feet water, though immediately on the sea side there are 40 feet, and immediately on the land side there are 30 and 37 feet, and so on. Tracing the river a little further landward, we have an inner bar by the shoalings of this deep channel to 17 and 18 feet, and then deepening again to even 60 feet at the Narrows of Broughty Ferry. This inner bar corresponds with the 9 feet bar of the Tyne, and is formed like it by the "wheel" stream. Broughty Ferry and Port Craig exactly resemble North and South Shields by narrowing the entrance, and the deep channel to the Narrows so made is like the "Narrows" in the Tyne. From the Narrows, or Broughty Ferry, to near Dundee, the resemblance from the Tay to the Tyne ceases. Its shores continue for some distance nearly parallel to each other, and consequently the channel retains its great depth, 50 to 30 feet, till the shores greatly widen out at Dundee, where the sand-banks and shallows begin. I would observe, that as from the South Shields shore, so from the Port or Craig shore, there is an insand, called "Newcome;" but owing to the parallelism of the shores, this sand cannot, as in the Tyne, form to an injurious extent. Now, I contend that the Tay is as striking an illustration as you can have of what I referred to in my evidence on Thursday, as the consequence of the flood tide overrunning the entrance from the projection of the headland on the side from which the stream comes. There is this further resemblance between the mouths of the Tay and the Tyne: you will observe on the chart of the Tay, between Buddon Ness and Broughty Ferry, an encroachment on the shore, called "Moneyforth Sands." This encroachment or bay is caused by the "wheel" stream principally. The same encroachment is taking place in the shore between Tynemouth Head and the Low Lights at North Shields, and from the like cause. Now, I am quite sure I need not say, that in proportion as the Gaa Sands increase and extend from the point of Buddon Ness, or, in other words, as the head of Buddon Ness extends eastward, so the difficulty which the tide will encounter in entering the Tay will increase, or, in other words, the water will enter more than at present in a "wheel" over the Abertay Sands. If the inset of the tide was simply a question of statical pressure, I see no reason why the current up to Broughty Ferry should not take a straight course, or rather flow in a general stream from the coast tide, converging to the defined deep channel at Broughty Ferry, and the reverse on the ebb tide.

All these sands, and the whole of this formation, establish, beyond all question, that neither the flood nor the ebb stream so enters the river. So in the Tyne, the Abertay Sands represent the Herd Sands, and Buddon Ness, the Tynemouth Head; and this Gaa Sand-bank is the Spar Hawk. The two outfalls are much alike in general character, and the like consequences result therefrom.

4270. (*Captain Fitzroy.*) While the tide is coming down from the north, and coming round as a wheel, is the ebb tide running out at the same time? is there a meeting of the two which causes that bar?—I apprehend only for a very small time, and to a very limited extent.

4271. Of course, at dead low-water this bank shoals?—At dead low water it does.

4272. So that at the very first of the flood-tide, while the water is rising in the offing, there can be no pouring of the water over this bank?—No; but you must look to the submerged part of the bank, as well as to the parts above low water; there is a very considerable submerged part.

4273. Still, it appears to me, that at the first of the flood this sand acts as a barrier to the entry of any part of the flood tide, and that during the first part of the flood along the shore, the ebb tide is still setting out of the harbour, meeting the stream, and the two together causing the throwing up of that bar, and that after the water has risen by the joint efforts of both streams, the flood gains the day, and begins to pour over the sand?—I have no doubt you would find earlier time of low water at the bar than at Broughty Ferry; but the difference, I take it, would not be more than three or four inches in level, and therefore if it were simply a question of statical pressure outside the harbour's mouth, such a difference of head would very soon be overcome. I am merely using this in illustration of the Tyne which it closely resembles in all these particulars.

4274. (*Chairman.*) Before you quite conclude your evidence on the Tay, will you give as the practical result what has been done with the Tay, and what ought to be done with the Tyne?—My own feeling on the matter is this. If I was called upon to improve the entrance to the Tay and to increase the tidal volume up its estuary, I should certainly not think of constructing any work from the northern headland. I should confine my operations to works over the southern sands, so as to catch the early flood stream, and to coerce it in a straight course to the harbour's mouth. I will illustrate my meaning by a reference to the chart of Montrose Harbour. Of course you will all be aware that the River Tay and its estuary are about the largest in Scotland, and that you have therefore in the case of the Tay, an enormous volume of tidal as well as land water; yet, that the united power of this vast mass of backwater, though it makes a better bar and deeper channel than are found in the Tyne, cannot prevent the same kind and formation of sand banks as exist there. Here is the Admiralty chart of Montrose Harbour, situated only a little further northwards. It will be seen that the "Ness" Head much resembles Tynemouth Head, but that at Montrose the headland runs off on the south side of the entrance, Tynemouth Head being on the north side of the entrance to Shields. At Montrose you find the "Annat Sands" as the equivalent of the "Herd Sands," with this important difference, that they are north instead of south of the entrance. Now, though as at the Tay and the Tyne the flood tide is from north to south, or directly across the entrance there is no bar here. I should observe, that the estuary of Montrose is comparatively small, and the Eske River which discharges into it, as contrasted with either the Tay or the Tyne may be regarded as a mere brook. Still, though the "Annat" Sands offer ample materials for its formation, and the coast is much exposed to the north-east winds, here there is no bar—on the contrary, the three fathom sounding line will be seen to b almost parallel with the coast, whilst the depth of the channel is maintained from the se into the harbour with great uniformity. I have been professionally connected with Montrose Harbour, and therefore I can speak to it from personal knowledge.

4275. Will you state what has been done to improve it?—Improvement is not required, and there is no sea bar to be removed. We will now refer to the chart of Aberdeen Harbour, which, though not so striking a case as Montrose, principally on account of piers having been constructed at the entrance, chiefly with a view to stop the in-run of the sea, will show, that though extensive sand-banks beset the entrance, no defined sea bar exists. You will observe that the headland of "Girdleness" extends eastward for a considerable distance, as in the case of Montrose, it runs off from the main land on the south side of the harbour entrance and far beyond the line of sands forming the north side of the entrance. The flood tide here, as in the other harbours referred to, comes up from the north or across the entrance, but the northern shore sand-banks do not form a ridge or bar across it, nor do the soundings on the coast show such or the like kind of submerged banks as the Tay and the Tyne present.

(*Mr. Webster.*) There were some other matters, Sir, which Mr. Rendel was to furnish.

(*Mr. Rendel.*) I am sure the Commissioners will see that it is better for them to appoint some engineer to get out a minute comparison of the surveys, than that I should examine them. I have looked over the two lower sheets of Comrie's survey, and I find a difference. I should, however, say that there is not any material difference in the sectional area of the river, so far as I have examined the new soundings. The changes which I refer to are in the relative positions of the banks and channels, and these changes are mainly confined to the two sands, the Durtwich Sand, and the Jarrow Sand, opposite to Hay Hole, all of which sands appear to be moving more down the river, comparing their

J. M. Rendel, Esq.

12th Feb. 1855.

positions now with what is shown on the survey of 1849. I should wish now to explain some points referred to by the learned counsel opposite (Mr. Seymour) last Thursday, as to some evidence I gave in Parliament in 1849. First, whether I did not then say something which differed from what I have said in my report of 1851, and since. I really do not perceive the difference. I should, in the first place state, that the whole evidence referred to, namely, that of 1849, went (as Mr. Clayton is aware) to this effect, viz.:—that I was then examining into the question of improving the Tyne, and that I really was not then in a condition to speak with any degree of precision with reference to what was the best mode of treating the river, not having then completed the survey, or tidal observations. I was pressed upon some points, particularly with reference to some improvements up the river, required for the convenience of different establishments and wharfs, and I said then, as I say now, that I would unquestionably make those improvements, in anticipation of any others lower down the river. In my report, as printed by the Commissioners, at page 15, you will find these words: "The whole of the works between the "bar and Bill Point, are so necessary to any very considerable improvement in the "navigation, that they should be regarded as the first section to be executed. All the "works comprised in it, should be begun at such times that they might be completed "simultaneously within four or five years from the commencement of operations. To "accomplish this," (that is to complete them simultaneously,) "the first work set in hand "should be the south pier," because it would take the longest time. "When this is "sufficiently advanced, the north pier should be commenced. As soon as it is raised above "the level of high water, the two remaining piers at the Narrows, and the works between "White Hill and Bill Points, should be pressed forward so as to be ready by the time "the north and south piers are finished." All I can say is, that if there is any contradiction between my evidence and these reported opinions, it is simply the result of this report having been written after I had all the information before me which I referred to in my evidence of 1849, as necessary to enable an engineer to report, and consequently the evidence given in 1849, is not, in my judgment, so much to be relied on as the deliberate opinions given in my report. With reference to the question about Belfast Lough, I have brought with me the plan to which that document referred, and I have brought with me also my manuscript report. It having been written so long ago as 1845, it had entirely escaped my memory at the moment. That is the plan which was sent to me by the Admiralty to report upon. I am quite sure you will see that there is no kind of analogy between that case and the case of the Tyne. Belfast Lough is a deep inlet of the sea, of great expanse seaward, but with converging shores up to the town of Belfast, where there are some slob-lands, and the question was, whether these could be embanked so as to carry a railway across a part of them without injury. My report was yes, provided you, the applying parties, will also make an embankment on the opposite side of the navigable channel, up to the quay of the town, and so extend the improvements which Mr. Walker had begun, by confining the river water between training banks at the harbour. There was no sea bar to wash away. There is no kind of analogy.

4276. (*Mr. Seymour.*) Is there any exclusion of tidal water there?—Certainly there is, but the tidal water is not there valuable, there is no bar to scour.

(*Chairman.*) I think it is not worth while to go into that question.

(*Mr. Rendel.*) I am sure that there is not one of the Commissioners who will not see that the cases are entirely different.

(*Chairman.*) What we want to elicit are questions of fact, and what Mr. Rendel recommends in the Tyne, much more than what he recommends in any other river.

4277. (*To the Witness.*) How long is it since you have seen the Tyne yourself with your own eyes?—I think three years.

4278. Did you think at that time that any encroachments on the tidal waters of the river by jetties, embankments, and other works executed and proposed, had injured the navigation?—I did not think they had up to that time. I will state why I give that opinion. I found in 1851 that the total tidal capacity of the Tyne, taking a 15 feet tide, was very nearly 29,000,000 cubic yards of water; that is to say, the whole basin within the Narrows would hold, at a high tide, taken according to Mr. Comrie's survey, 29,000,000 cubic yards of water. I considered that quantity of water was quite sufficient, when properly applied at the bar, to do all the work which was necessary to make and maintain a good entrance. I have found many of my notes upon this subject, and I should rather like, if the Commissioners wish to pursue the subject, to state from these notes a few of the facts upon which I reasoned before deciding on a plan and making my report.

4279. (*Chairman.*) Certainly, that is the very thing which we should most wish to hear?—The extracts and memoranda from these notes are these:—The winds, sea, and coast tides form the sands of which the bar is a part. It is clear that if there was no river, these sands would collect up to the Tynemouth headland. The work therefore to be done by the river, is to prevent this growth of sand, and to maintain a navigable passage through it. The more effectually this work is performed, the better the bar and the entrance channel will be, and the converse. It is clear, therefore, that it is the business of the engineer to direct the river, as the workman to form the channel. In the present case (that of the Tyne) the object of the work to be done is the maintenance of a sufficiently wide channel for vessels to get to and from sea with facility, and of a sufficient

depth for the class of shipping wanting accommodation. If by any application of the land waters alone, this could be done, then the aid of the tidal water might be dispensed with in the river, and all the improvements up it might be made without reference to the provision of a receptacle for the tide. That the Tyne is not in such a position all must agree after investigation. Unaided by tidal water, the channel seaward of the Narrows would be a winding course, perhaps not deeper than half-tide, and running along the southern shore. Take, for instance, the Dee and Berwick Harbour. The question then is what quantity of tidal water is required under the most favourable application of its scouring powers. The decision of the engineer on this point, must of course be influenced by the facilities required by vessels getting in from sea in north-east winds, the worst they have to encounter on this coast. But I think it would be the most unfortunate thing for the trade of the Tyne to study these facilities beyond the point to which they could be carried, compatibly with the main object of deepening the entrance and extending the time each tide when vessels could pass. As respects any projecting north pier, it is to be feared that it will increase rather than decrease the amount of sea at the entrance in northerly gales; more particularly if, as I suspect, the bar would be transferred to its head. This takes one back to the consideration of the effects of a stricture at the entrance, and suggests that if a north pier is to be built, it must not be connected with, but must be detached from the Tynemouth shore. Seeing then that a great quantity of tidal water is wanted for the entrance, the way to procure it so as to be most consistent with the wants of the channel up to Newcastle, is a great question to be considered. Now it is clear that it is desirable to make as uniform a current as possible along the whole line of the river, and that to do this, every part of the river must have a section proportioned to the water passing through it. If the quantity of water required could be obtained above Newcastle, then it would doubtless be best to have the channel between the sea and Newcastle put between high-tide walls, but this is not practicable, and hence we come back to a necessity for having our reservoir below Newcastle, and providing it in a manner that will be attainable at a justifiable expense; in fact to make a compromise between what is engineeringly best, and what can be obtained for the money which the trade will admit of being expended. Now it will be granted, that the more narrow the channel is made, the quantity of water remaining the same, and the bottom being soft, the deeper the channel will become, and the less liable to shoals after land floods. But even supposing as an extreme case, the flow of tide at Newcastle will be the same as at sea, then even the cubic capacity of such a channel for tidal water, could only be its area multiplied by the whole column of tide. I will suppose the distance from the Narrows to Newcastle to be 11 miles, and that the average width between the high-tide walls is even as much as 600 feet; then the area of the channel will be $11 \times 1760 \frac{600}{3} = 3{,}872{,}000$ square yards, and taking the greatest rise of tide as a mean for the whole channel at 15 feet or 5 yards, we have $3{,}872{,}000 \times 5 = 19{,}360{,}000$ cubic yards as the total possible quantity of tidal water in a channel so formed. It is proved by actual calculation, that the present estuary between the same points, taking the tidal contents as found in 1850, contains, when the tide rises 15 feet at the Low Lights, about 29,000,000 cubic yards. I think that the tidal water could not thus be reduced (and it is the most favourable view that can be taken of whole-tide walls) without the greatest risk to the maintenance of a good entrance. The equalizing of the duration of the flood and ebb tide would be nearly as well established by half-tide as by whole-tide walls. Again, as regards silting, all experience shows that there is even less silting at the foot of half-tide than of whole-tide walls, particularly in a curved channel. Then we come back to the question, how is the requisite tidal receptacle to be increased, and the navigable channel up to Newcastle improved at a reasonable cost? To do so by widening it, so as to retain the whole-tide walls, would be to diminish the current, particularly of land floods, on the good of which so much stress has been laid, and allow it to form a winding course, and consequently to give rise to banks, and loss of back-water. If this be so, half-tide walls, with the proper width of channel between them, seem the obvious remedy, for here we have a certainty of retaining the necessary area for tide water, and that in a manner which will be likely to be nearly permanent, the half-tide walls tending rather to cause a deepening on each side of them, though some shallowing between them and the shores is to be expected; as may be seen in that class of harbours having large tracts of half-tide banks or sloblands on either side of them; as is the case with Wells Harbour, which is a striking example of how the running off of water from half-tide banks promotes the maintenance of the depths of channels between them. Portsmouth Harbour is another instance where you have deep channels between sloblands or banks which are seen at about half ebb. Such walls are as effectual as whole-tide walls for applying the power of land floods to the scour of the channel. Also at and during neap tides they are just as effectual. But it is said that whole-tide walls propagate the momentum of the ascending tide more than half-tide walls: granted; but the question is, to what extent, and what would be the value of such increased momentum in additional tidal column up to Newcastle. Judging from the Dee and the Clyde, I think it would not be much. But as a question of practical engineering (and really this is the view which I took of it at the time) I am prepared to attach the greatest importance to the circumstance that it is more prudent as well as more economical to try the effect of half-tide walls first, even though whole-tide ones should be ultimately carried out; because the results they will develope will doubtless guide the engineer in his future

J. M. Rendel, Esq.

12th Feb. 1855.

J. M. Rendel, Esq.
12th Feb. 1855.

operations, and will be so much done towards the end to be attained, if that should be whole-tide walls; whereas, if whole-tide cross groins are to be first used as a scaffolding for whole-tide walls, and with a view to filling up the shores between such groins to high water, as a preliminary step, then it is clear that there can be no retractation should the effect on the entrance be adverse. This is all I have to say upon the subject. I have made a small extract from my note book as to the relative quantities of tidal water and fresh water passing over the bar each year, which, if it is of the smallest interest to the Commissioners, I can give them.

4280. (*Chairman.*) If you please.—The quantity of tidal water in the course of a year passing over the bar on the average of springs and neaps may be taken at 29,200,000,000 cubic yards. The area of the catchment of the Tyne being 1000 square miles, in round numbers; the quantity of land water passing off at Newcastle is about 1,750,000,000 cubic yards.

4281. (*Mr. Seymour.*) Is not the case of Wells, to which you referred, like Montrose?—No; on the contrary.

4282. Is not Wells a pure tidal receptacle?—Clearly in that respect it is; but Wells Harbour is a series of meandering channels traversing a great extent of flat land, covered at high water. Montrose Harbour is a large basin estuary, filled and emptied by a narrow channel to sea.

4283. But Wells Harbour is a purely tidal receptacle, or nearly so; the streams are very small?—They are comparatively; you may well call it a tidal receptacle, but it is an entirely different kind of one to Montrose.

4284. Are the sand banks or mud banks which you speak of in Wells Harbour open to the sea?—There are no similar banks.

4285. Are there any mud banks?—There are marshes which the tide overflows, but it is not a parallel case at all.

4286. It is not a parallel case to what?—It is not a parallel case to Montrose.

4287. But is it a parallel case to the Tyne?—Not the least; I am only instancing the fact that water running off from half-tide banks into a deep channel between them, promotes a scour on the channel along the margin of such banks which adds to the maintenance of the channel.

4288. At what period is the scouring influence of the water greater in a river, for instance in the Tyne?—It depends upon a variety of circumstances; as a principle, the scouring effect will be the greatest when the largest quantity of water is passing with the greatest velocity.

4289. With regard to Montrose Harbour, is there any slope or fall in that harbour at low water?—There will be a slope at low water, supposing the water to be running out up to the time when young flood makes up the harbour.

4290. Can you tell to what extent that takes place?—You may have at the least slope about an inch and a half to a mile.

4291. I think you said that on the last day you were examined that if you extended the Tynemouth Headland the Herd Sand would go along with it?—I think the more you extend the Tynemouth Headland the further out you will bring the Herd Sand.

4292. To what is the present condition of the Herd Sand mainly attributable? Is it in your opinion to the circumstance of the eddy round the Tynemouth Head which you speak of, or to the effect of the ebb depositing the sand there?—I have always likened Tynemouth Headland to a groin, which, as we know, has the effect of collecting sand on the eddy or opposite side to that from which the stream comes that brings the sand.

4293. As a matter of fact, does not the deposit at the Herd Sand proceed during the ebb tide. Through the whole of the ebb is not the depositing process going on at the Herd Sand?—I have no doubt that you have a large quantity of sand moving in and out of the harbour by being taken up by the stream over the Herd Sand, and that much of the sand so taken into the harbour will be brought back by the ebb and re-deposited on the Herd Sand. But in all rivers the effect of deposits on the ebb are more observed than those made by the flood. For instance you cannot land at steps in the Thames on the ebb tide without finding a considerable deposit of silt mud upon their surface.

4294. However as a matter of fact the depositing process proceeds principally during the ebb on the Herd Sand?—Yes, in the sense of the word deposit as you apply it.

4295. Then the effect of the flood tide is to put the Herd Sand in a condition of motion, to tear up a portion of it, and to carry that into motion, which otherwise the tendency of the deposit on the ebb would be to settle?—Yes; as you put the question that is the case, but the flood tide does not make the Herd Sand, or the ebb tide either; the sand is brought there not by the river—these sands are the debris of the coast brought along by the flood stream and northerly winds, and lodged here from its being a place of rest, protected as it is by the Tynemouth Headland.

4296. Supposing the south pier, as at present proposed, is arranged, will not the effect of it be to prevent the operation of the flood tide upon the sands within the area circumscribed by the pier?—No doubt. It will destroy the wheel, which is the agent, the chief agent which carries the sand from the Herd into Shields Harbour.

4297. When the action of the flood, which you call the wheel, has ceased, the ebb proceeding to make the same deposits as before, will not the tendency of the area enclosed by the south pier be to fill up?—Yes; and thinking so, I have the greater objection to the

enclosure you are making. I regard it as a land reclamation, instead of making, as it has been said, a harbour of refuge. On your own supposition, you are making works to reclaim land, and not to secure deep water.

4298. I put the supposition merely to ask your opinion?—I do think that that would be the case, though you would have such an amount of in-run of sea through that entrance as would so disturb the sands that it is probable they would be comparatively levelled down over the whole of this space a great flat sand, having variable channels. That is my opinion.

4299. Do you speak to the whole or to the entrance?—I speak to a very large proportion, but more particularly to this space within and opposite the entrance, where the stream it causes will end. In the more favourable cases of tidal docks, we find in all cases banks form in the docks, some distance within the gates through which the stream enters the dock.

4300. Taking the plan adopted by Mr. Walker, you say that near the entrance the effect of the water would be to prevent that accumulation which you have spoken of?—I think that the tendency would be this: that, as you cannot shut out the sand which the flood tide brings along the shore, and consequently will enter between the pier heads with the current, the sands so brought in will be deposited when the current which brought it is so much reduced in this wide part as to be no longer able to suspend it. The great contraction at the pier heads and the wide expanse of this enclosure must make a vast difference in the strength of the flood and ebb stream through it, and this must lead to the deposit of sand on the flood, and incapacitate the stream of ebb to remove it; therefore it was that I put guiding walls at the entrance in the plan which I recommended in my report.

4301. I understood you that the action of the sea would cause, if I may so speak, a sweep out of what otherwise would be an accumulation at the Herd Sand, near the entrance?—I am quite sure that your object and mine in this examination is to promote truth; I will, therefore, again try to explain my views to you. No form you can give to these piers will prevent the travel of sand along the coast, or stop it from being carried into the entrance with the flood tide, whilst its current is sufficiently strong to suspend the sand. If these propositions be granted, and they do not appear to me to admit of question, then it is manifest that, as the abrupt contraction of the entrance due to the form and direction of your piers, will give rise to eddy currents, both inside and outside of the entrance, sand banks will be formed where those eddies take place. Now, if there were to be no more waves, the banks caused by these eddies would be of a shape and kind that might be provided for; but as the sea will continue to break upon these piers when built, and the waves will pass into this wide space between their heads, the sand banks, formed as before described, will be spread out in all directions as a flat bank or shoal, extending, probably, on the inside across this wide part of the space you propose to enclose with your piers; and on the outside as an elongation of the head of the Herd Sand forming a new bar. Nor would the ebb tide, in my opinion, be able to check the growth of such inner and outer shoals, unless guided and aided in its course between a portion of the two piers made parallel to each other, and by the construction of guiding piers at the Narrows, as in my design.

4302. I wish to ascertain for my information a fact which I think you have stated; that, taking Mr. Walker's south pier as planned, inside the pier near the entrance of the harbour, there would be a sort of scooping of that which would otherwise be an accumulation. Would there be room for the wave to expand inside the pier?—Yes; that is what I have just stated. Your two piers are in effect two vast groins, run off from the opposite shores, so as to make a sudden contraction at their heads. You do the same kind of thing up the river in running out groins for the purpose of filling up the spaces on each side of them. Now if that be a bad plan for the improvement of the river channel, by interfering with the uniformity of the stream of tide up and down it, as I contend to be the effect of such groins, how much more objectionable it must be here at the very mouth of the river where uniformity of stream is so necessary.

4303. That of course is very legitimate reasoning for you to pursue, because I presume you are drawing a distinction between the plan which you would propose and the plan proposed by Mr. Walker; but taking Mr. Walker's plan as it is, I merely wish to get that it is your opinion that there would be room for the wave to expand within the head of the south pier, as proposed by Mr. Walker?—There would be room for the wave to expand, and there would be room for the current to expand, and consequently to diminish in such a manner that it would lose its power to hold the sand in suspension.

4304. Would there be an expansion of the wave also at the north pier to a somewhat similar extent, although not so large perhaps, say an analogous extent?—The waves which entered would expand on either side over this area.

4305. What would be the effect of a pier formed as you have suggested?—If you have my plan here I will explain to you the principles on which I designed the entrance works. I studied in the first place to extend the south pier eastward, as far as the sum said then to be available for the entrance would admit of, when taken in connexion with the other necessary works there; my next object was to so place it as to leave ample space between it and the shore of Teignmouth headland, for the admission of tidal water, and to constitute a commodious passage for vessels. As laid down I thought it would

J. M. Rendel, Esq.

12th Feb. 1855.

prove sufficient to catch the stream of young flood along the shore. From its head so extended and placed, I carried it westward for 1,100 feet, so as to guide for that distance the flood and ebb stream in the direct line for the Narrows; but at the point so fixed, I slanted its line to a south-west direction, so as to enclose a large portion of the Herd Sand and South Shields shore (forming this space) as a wave trap, to prevent their passage into Shields Harbour, which a straight continuous pier, as proposed by Mr. Rennie in 1813, would necessarily do, and therefore, though best for the scour of the channel, would have been injurious in this respect. To further direct the stream in the proper course, to and from the Narrows, and to prevent eddies that would be due to any sudden or abrupt contraction, or rather stricture, at the sea entrance, I deemed it requisite to form this north pier, which you see has its head to the west of the south pier head, but is carried nearly parallel to that pier till it bends off to the south-west over the Herd Sand. The distance between these two piers, though ample for navigation, is, as will be seen, such as must give a sufficient strength of stream in the flood and the ebb to scour away any sands brought into the navigable channel formed between them. But it will also be observed that this north pier is not attached to the Teignmouth shore, but on the contrary, leaves a very wide space between it and the shore, so as to make, with the navigable channel between the two piers, an ample section for the passage of tidal water to fill the estuary, as also a free passage for the sea, which the north pier is designed to catch at its back, and thereby diminish the amount of broken water across the navigable entrance in north and north-east gales. The object of this pier was also to mask the rocks off Teignmouth Head. To further direct the tidal current between these entrance piers and the Narrows; to further equalize its velocity over the wide intervening space, I designed those parallel walls, extending so far eastward, or in the direction of the parallel portion of the entrance piers; foreseeing that as the tide and sea would bring in, after all that could be done, considerable quantities of sand, and that this, as the shores grew up, would collect in the channel between the inner and the outer piers; the space between the ends of the parallel portion of the outer piers and the commencement of the inner piers, should not be more than necessary to trap the waves and prevent the further in-run of the sea; and even then, so brought under the operation of the currents caused by this double set of guiding piers as would insure a good channel, though perhaps not so deep as between the piers.

(*Chairman.*) I cannot see that it will at all facilitate our investigation to go into any further examination on this point; because the truth is that Mr. Rendel has given a plan according to his own judgment, and if you examine him to the end of the world, you will not convince him that somebody else's plan is better than his own, or that his own is a bad one.

4306. (*Mr. Seymour.*) With reference to the effect of the wave upon the inside of the pier, upon the pier which you propose, that effect would not take place: the wave would not expand within the pier; the 1,000 feet which you spoke of would prevent the wave spending itself within the pier?—No. I pointed out that I got all the advantage of the progress of the wave for 1,100 feet in length at the entrance, and have all the advantages from my wide space which you can get from yours.

4307. The tendency of the remaining portion of the Herd Sand would be to silt up, would it not, assuming the pier to be made?—I think there would be a tendency to sand up with flat or level and detached banks by your plan, but not so by mine.

4308. In proportion as it had a tendency to silt up, would it not have an influence in directing the channel of the river near the Narrows?—If you could, but which you cannot, make these banks accumulate so that they would maintain a straight channel between them, from your entrance or pier-head, up to the Narrows, then you need not coerce the tide in one stream between walls.

4309. Assuming that the tendency would be to silt up and accumulate, would the consequence be that that would have an influence which would direct the channel?—I fancy I do not understand your question, or that you do not understand my answers.

4310. Assuming this space to fill up (*pointing to Mr. Walker's plan*), would it not practically act as a natural pier in guiding the channel?—Yes, if you could make it fill up exactly as you point out; but I deny that you can do so without inner works.

4311. I do not ask you to say that you believe that our plan will succeed, but you have already told me that the tendency of the wheel of the tide at present is to tear up the Herd Sand?—Yes.

4312. That tendency would be checked by the construction of the south pier?—Yes.

4313. That tendency being checked, there would be a greater tendency in the Herd Sand to accumulate from the deposits on the ebb?—Yes, and from what was brought in on the flood.

4314. In proportion as that tendency proceeds, will not it approach to the position of directing the channel of the river?—I think not, because it will admit so much sea that the sea will level down the sands and bring them back into the channel.

4315. If the sea does that?—Yes, it is my firm conviction that you will have such an inrun of sea that the sea will bring down the sands, and spread them over this wide space of yours.

4316. I unfortunately assumed that you spoke merely to the mouth, and that the effect of the sea would be different near the mouth?—No, the sea will run in between two

piers, 1,000 feet in width; you will have a very heavy run of sea along that pier in north-east gales.

4317. The set of the ebb when it debouches from the river is northwards, is it not?—Yes, after the Herd Sand is uncovered.

4318. Why not before?—Because the early flood passes off on the covered portion of the Herd Sand as well as along the deep channel.

4319. However, the tendency of the ebb, after the Herd Sand is bare, you say, is to set northwards?—No, to set north-east.

4320. I thought you said northwards?—Outside Tynemouth Head it is northwards, but across the Herd Sand it is eastwards, and off Tynemouth Head north-east.

4321. Assuming that the tendency of the ebb is northwards, when it gets out of the mouth of the river, I want to know whether at present that tendency is not checked by the rocky shore abreast of the Spanish Batteries?—To no appreciable extent. I think it is checked more by the bar than by the shore.

4322. Then, in your opinion, would the erecting of the north pier, as proposed by that plan, have any effect upon the set of the ebb?—No, I do not think it would. I look to the south pier as doing all that work.

4323. Would your north pier give any shelter to vessels making for the harbour in north-easterly gales?—No, neither would your pier give shelter to vessels making for the harbour; but my north pier would, in north-east gales, lessen the amount of broken water at the entrance, by throwing the sea behind it on the Tynemouth rocks, whereas your north pier would gather the sea at your entrance. If your object is, as I have heard it stated, to make a harbour of refuge, you had better leave the mouth of the Tyne. I have yet to learn where to find a site for a harbour of refuge at the mouth of such an estuary, surrounded as it is by sands.

4324. But you have deep water, I presume?—Yes, but the deep water is only a question of time in such situations as this.

4325. You spoke, when you last gave your evidence, with reference to the 9 feet bar; to what do you attribute the formation of the 9 feet bar?—To the wheel. I mean that there is a large quantity of water passing into the Tyne on the land side of what you call the 9 feet bar, and that this stream so passing into the main channel, forms by the circular motion which it obtains, an eddy between it and the sea bar, and that your 9 feet bar is result of this eddy. You have it in the case of the Tay, and the same result as pointed out to you this morning.

4326. I presume you have read Mr. Walker's report?—Since you gave it me I have scanned it over, and that is all.

4327. With reference to the 9 feet bar, does not he attribute it to the influence of the bank called the Stones, and the effect which that has upon the set of the ebb?—I have not observed that such is his opinion.

4328. Do you know that both Mr. Walker and Mr. Brooks attribute the formation of the 9 feet bar to the effect of the bank called the Stones upon the current of the ebb?—I do not; I think it is due to the eddy caused by the rush of water over the flat part of the Herd Sands.

4329. Are you aware that since some portion of the bank of the Stones has been removed there is a truer set of the current of the ebb there, and that the 9 feet bar is diminished?—I can understand the lessening of this bar by increasing the power of the ebb tide after the Herd Sands are up, and I see how the removal of "the Stones," will cause such increase; but I doubt whether you will be able to prevent the deposit of a bank in this part of the channel, whilst "the wheel" stream is in force.

4330. You spoke also of the In-sand; to what do you attribute that?—I attribute it entirely to the ebb tide down Shields harbour not being in the same course as the stream of flood tide through the Narrows. The inner piers shown on my design would greatly tend to the correction of this evil also.

4331. You say that the in-sand is a deposit on the ebb?—I say it is caused by the ebb stream through Shields harbour setting first along the west end of the South Shields shore, and then crossing over to the east end of the North Shields shore, whilst the strong flood stream from the Narrows sets upon the east end of the South Shields shore, but is incapable of breaking through this in-sand, owing to the loss of velocity in passing so suddenly from the Narrows into the wide expanse of Shields harbour. This in-sand is formed in the same way as I have described banks will be formed within your proposed new piers.

(*Mr. Seymour.*) I understand, Sir, that your opinion is that it will be more satisfactory to the Commissioners to arrive at the result of a comparison of the soundings hereafter, and not to press Mr. Rendel upon it?

(*Chairman.*) Yes.

4332. (*Mr. Webster.*) You have been asked several questions about the Herd Sand, will you be so good as to tell the Commissioners at what period of flood the Herd Sand is covered?—The outer part of the Herd Sand is covered at a very early time of flood. When I was last there the head of it was very flat; a large portion of it is submerged and connected with the sea bar.

4333. Would it be incorrect on any assumptions that are made as to the effect of these

J. M. Rendel, Esq.

12th Feb. 1855.

piers of Mr. Walker, if constructed, to assume that there would be a distinct channel, and that the Herd Sand would not be covered, excepting at a late period of the flood?—I should think quite incorrect.

4334. In viewing the question of the effect of these piers for the entrance of water by statical pressure only, you must assume that from a very early period of the flood the Herd Sands would be covered?—Clearly.

4335. My learned friend has asked you several questions respecting the south pier, without reference to the north. I understand you to say that one object of the south pier, or if you had two, of carrying the south pier beyond the north, would be to catch an earlier portion of the flood-tide, and so increase the quantity of tidal water going into the harbour?—That was one of the objects to be attained by my design.

4336. Is the enlargement of the section within these piers, assuming them to be constructed, such that there would, from a very early period of the flood, be such a diminution of velocity that there must be a deposit of sand?—I cannot imagine any formation of piers more calculated to promote a deposit of sand within them than the form of those piers, and that at the very mouth of the harbour.

4337. Assuming that you are right, that there would be this tendency to deposit the sand within, would that directly affect the quantity of tidal water going up?—No doubt of it.

4338. You told my learned friend just now, in answer to a question which he put to you, that in your opinion the bar would go seaward with such piers, but that it would be a question of time?—I think the bar would re-form outside these pier heads, and that in time it would seriously affect the harbour.

4339. Having regard to your experience in other places, and the position in which this entrance would be, assuming such piers constructed, have you any doubt that such a bar would be formed?—I have no doubt about it.

4340. Would there be the formation of a bar which would obstruct the entrance of tidal water quite independently of the obstruction which the deposit over these Herd Sands would occasion?—I think so; and such as would cause a breaking sea also.

4341. So that in your view of it you would then have two obstructions; firstly, the bar created by the piers, and secondly, the deposit over the Herd Sand?—Yes; my view is that you will carry the bar with those piers, and that it will in this position much more interfere with the navigation and with the quantity of water passing up and down the Tyne than the projectors of the plan seem to anticipate. I also strongly object to a north pier, if connected with the land, because I have always found that such a pier, placed on the weather side of an entrance, and formed as this is, greatly increases the sea across the entrance. In the plan which I proposed, the north-east seas would be caught at the back of the north pier, and the broken water would be thereby thrown up the rocks of the Tynemouth Head. By this plan of pier the sea will run along it and add to the broken water, which if a new bar is formed, will be occasioned by it at the entrance, which will increase the difficulties, and lessen the time each tide that vessels can pass to or from the harbour.

4342. In advocating the south pier, or its extension beyond the north pier, had you any reference to the cases which exist in nature to which you have this morning called the attention of the Commissioners, of a south projection beyond the stream of tide?—Clearly.

4343. In the views which you expressed to the Commissioners this morning, showing things in a state of nature as they exist at Montrose, do you consider that the south pier would be somewhat analogous to that?—I think so.

4344. If these piers were to be constructed with reference to a harbour of refuge rather than the navigation, you say, in your opinion, they would fail?—I think so. Even the promoters of this plan anticipate that the sand will grow up on either side of the channel and form a kind of upright wall or bank for the guidance of the stream from the entrance to the Narrows.

4345. (*Mr. Seymour.*) You spoke about the tendency to increase to a certain extent, and I asked, so far as that influence did result, what its effect upon the channel would be?—You cannot have banks in such a form as will direct the stream of flood and ebb-tide in and out of Shields, without having sand banks over these spaces; and if these spaces are so filled with sand, it is clear there can be no harbour of refuge.

4346. (*Mr. Webster.*) Supposing that this should fail altogether, or be inapplicable as a harbour of refuge, what would be the state of it as regards sands; would it be a large mass of sands?—I have said so.

4347. Would it be suitable for any other purpose than for laying up vessels upon, or a large lumber dock, so to speak?—It is multiplying objections; but my own opinion is that it will be a sand-trap rather than a navigable channel, or a harbour of refuge. Such is really my opinion.

4348. Such sand-trap would be suitable for laying up vessels upon, but not as a proper entrance to the navigation?—You have my opinion.

4349. You have referred to some calculations which you had made on a comparison of the sections, and I understand you to say, that in your opinion, if the upper part of the channel is to be contracted to the extent to which you have referred, there must be an exclusion of tidal water?—Clearly. I gave credit to the channel so formed for the whole tidal column going up to Newcastle.

J. M. Rendel, Esq.

12th Feb. 1855.

4350. With reference to the question of excluding tidal water you probably agree with other witnesses, Mr. Stephenson for instance, that it ought not to be allowed?—I should not allow it to any material extent until I had so far advanced my works at the entrance as to prove that it might be permitted.

4351. Have you ascertained by a comparison of the state of things when Giles surveyed the river in 1813, and the lift of tide then at Newcastle, and the Low Lights, and the Survey of Comrie in 1849, what was the flow of tide at Newcastle in 1813 and 1849?—I found by the survey of Comrie in 1849, that the spring tides did not rise at Newcastle to the same height, in level, as at the Low Lights, by, I think, about five inches. Rennie having reported, or Giles having stated upon his plan, that the spring tides, uninfluenced by wind, flowed level throughout the whole length of the river to Newcastle Quays.

4352. So that in the interval between 1813 and 1849 there had been a less flow at Newcastle, as compared with the Low Lights, to the extent of five inches?—Yes, supposing both the surveys at these dates to be correct.

4353. Had there during the same period been a reduction of the tidal area to an extent of nearly 60 acres; that is, between the years 1813 and 1849?—Yes; but I do not think that reduction had anything to do with the difference of tidal flow.

4354. But I presume you would agree with Mr. Stephenson, for instance, that the tidal area might be reduced to such an extent that you would have a less flow of necessity at Newcastle?—Yes.

4355. You have spoken of approving generally of the principle of cutting off bulbs on the river as increasing the momentum?—Yes; whenever you cut off a bulb of the kind referred to, you unquestionably increase the momentum, but there must be a limit to the cutting off of bulbs, when the loss of tidal water becomes so great that that which remains is incapable of performing the work which it has to do at the harbour's mouth. As I have said before, if you could by possibility have the necessary tidal receptacle above Newcastle, then you might do as you liked with the form of the estuary below Newcastle, and so give it the best possible form for navigation up to that town. But you must have the requisite receptacle somewhere, and in this case it must be between Shields and Newcastle.

4356. As an abstract principle you would agree with other scientific witnesses who have spoken of the injury to the momentum of the rising column which bulbs produce?—Yes, as an abstract question.

4357. To apply this case to Jarrow Slake, for instance, and to other instances upon the Tyne, what is the measure of the limit to which those bulbs may be taken off so as to prevent injury to the bar?—I believe that taking off such shallow tidal creeks as these (*pointing to the plan*) would have the effect, if done with judgment, of sending the quantity of water which now fills such bulbs further up the river, and thereby increase the tidal column. That there is room for such increase of rise is shown by the fact that according to Comrie's observations in 1851 the tides at Newcastle did not rise to the same level as at Shields. Thus, there would be no loss of tidal water until the tide rose to its proper level in the higher parts of the river. That end attained, there should be no further reduction in the tidal receptacle till the effect of the works at the harbour's mouth had been fully ascertained. I hope I have made myself clear on this point. I cannot say more upon this subject as regards the Tyne.

4358. You did not hear, I think, Mr. Stephenson's evidence?—No.

4359. Assume as a fact, if you please, that in the evidence which he gave he assumed that the same quantity of water would go through the minimum section at the Narrows; I ask you upon that assumpsion what is the limit to which you could alter the position or abstract tidal area, so as not to produce a reflex action at the Narrows, which he, and probably you, would agree to be injurious upon the quantity coming in?—Certainly. You might more than fill the river up to Newcastle. You might get it to run at a higher level at Newcastle than it attained at the Low Lights. To what extent you could make the tide at Newcastle rise above its level at the Low Lights becomes a most complicated question, even if all the conditions for its investigation were given. It might be possible to get a rise of 18 inches on that distance, with wind and tide favourable.

4360. Does every dealing with the tidal area in the nature of abstraction at one part necessarily produce a heaping up of the water in the channel?—No.

4361. Then where does the water go to?—It does not necessarily go into the estuary at all.

4362. Assuming for the present that the same quantity of water goes through what we call the minimum section at the Narrows, will every dealing with the tidal area above produce a heaping up of the water in the channel?—Assuming that the same quantity of water passes into a small reservoir as passes into a large one the surface of the water will of course be higher in the small reservoir than in the large one. As applied to this case, the tide would rise higher in level.

4363. Is it any question of calculation upon the actual sections of the river to what extent you may venture so to deal with the tidal area at the sides, and to what extent you may venture to heap the water up in the channel to Newcastle?—No. Calculation in such a case must be based on a given state of channel, bottom as well as sides, and on a given head and current of tide. But practically we know that those vary with the winds, with the quantity of the fresh water in the river, and still more by the variations

J. M. Rendel, Esq.

12th Feb. 1855.

which take place in the bed of the channel. All you can hope to gain by calculation is an approximate result; he who attempts more will find himself at fault.

4364. Is the result to be anticipated from these full-tide walls that you are to have a higher level up at Newcastle?—Yes; that appears to be the assumption.

4365. Will that necessarily be accompanied with an increased reflex action at the minimum section?—No doubt.

4366. And, if that is carried beyond a certain extent, will it diminish the quantity of water coming in through that section?—No doubt.

4367. Is the necessary tendency of any heaping up above, consequent upon a reduction of the tidal area, to produce a reflex action?—Yes.

4368. It has been assumed that in thus dealing with the river, above its minimum section at the Narrows, there would be the same quantity of water going through the minimum section. I will ask you whether if you deal with the tidal area above the minimum section, so as to occasion a heaping up in the channel, and a higher head from its minimum section up towards Newcastle, it of necessity produces a reflex action, which has a tendency to reduce the quantity of water coming in through the minimum section?—It will necessarily produce a reflex action at the Narrows, and if this takes place before it is high water, it will lessen the quantity of water passing that minimum section.

4369. Then, as a consequence, may the slope of the surface be so increased that from the reflex action you have less water through the minimum section?—Clearly.

4370. A good deal has been said about the advantage which results from this increased slope as regards the fall of the tide on the ebb, what is the limit of that advantage in a river like the Tyne; can it be lower than the ebb at sea, for instance?—Clearly not. But I would again observe that nothing can be more unsatisfactory in examinations of this nature than to hear and answer questions on such subjects unless the question comprises all the modifying circumstances with the necessary precision. It is all very well for the philosopher in his study to say with this given set of conditions I shall have these results, but the practical engineer knows that there are so many modifying circumstances that his safest course is to be guided by general principles, in cases of this kind; in other words, to feel his way, and not to look to calculations for anything beyond approximations to the truth for guidance on his way.

(*Chairman.*) The great misfortune of this examination is that instead of applying the evidence to the Tyne, we are arguing on abstract principles which may, or may not, be correct.

(*Mr. Webster.*) You will remember, Sir, the particular position I was placed in by Mr. Stephenson.

(*Chairman.*) You had better go on, time is always lost by interfering.

(*Mr. Rendel.*) I would beg, if that be so, to state that I am perfectly certain that upon general principles there will be no difference between Mr. Stephenson and myself, and therefore I should like, before I am thus examined upon Mr. Stephenson's evidence, to know what that evidence was, questions as well as answers.

(*Chairman.*) I think it is hardly fair to Mr. Stephenson or to Mr. Rendel, as he was not present when Mr. Stephenson gave his evidence, and has not seen it, to put hypothetical questions to him on the subject.

(*Mr. Webster.*) I am quite sure you will not suppose that I want to bring Mr. Rendel into any contradiction with Mr. Stephenson, but to ask him upon one particular point about the abstraction of water at the minimum section—he agrees with it.

(*Mr. Rendel.*) I am perfectly satisfied that a great deal of the obloquy which is thrown upon engineering evidence is from the circumstance that one engineer is examined in the absence of another, the questions put to them do not agree, and the answers of course cannot, if correct. There may be great differences between Mr. Stephenson and myself as regards the applicability of general principles on which we are agreed, to a particular combination of modifying conditions, where as in this case they are so many and so variable. If, therefore, my evidence is to be contrasted with Mr. Stephenson's, I must beg of the Commissioners to allow me to see his evidence, and in case I find we differ on principles, to permit me speak to Mr. Stephenson, so that we may agree on our facts and principles, though we may not draw the same conclusions from them.

(*Chairman.*) In the meantime it will shorten the business very much if you just say in answer to questions of this sort that they are abstract hypothetical questions which you would rather not answer.

(*Mr. Rendel.*) If the learned Counsel will take that answer, I shall be satisfied.

4371. (*Mr. Webster.*) I believe you are very well acquainted with the Nene and the Ouse?—I am.

4372. Have you reported upon both of them?—Yes. I am engineer for Lynn harbour, and therefore I know the Ouse; and I am engineer now also for carrying out works upon the Nene above Wisbech.

4373. As regards those cases, do you reckon them as similar cases to the Tyne harbour, or to the Clyde?—Not at all.

(*Mr. Brunel.*) There again, I may be excused as a brother engineer for a little objecting to that mode of putting the question. You can hardly find two things in this world which have not some point of similarity, therefore when you ask an engineer whether he can

suggest any similarity between the two he will probably point one out. If ten minutes afterwards you ask another man whether there is any similarity, he may say no. Now what do we gain by the contradiction?

(*Mr. Webster.*) I was not going to put a contradiction or anything like it.

(*Mr Brunel.*) You lead to one. Mr. Stephenson pointed out some similarity, and it would be very difficult to find two rivers which had not some similarity, though they may be very dissimilar in general character.

(*Chairman.*) After all, what have we to do in the Tyne, with the similarity of the Ouse.

(*Mr. Webster.*) I can only go by steps.

(*Mr Brunel.*) Mr. Stephenson put some instances of the scouring effect in which no doubt there must be some similarity.

4374. (*Mr. Webster, to Mr. Rendel.*) So far as regards the question of retaining water between parallel walls, I apprehend there will not be any difference between the Nene and the Ouse, and the Clyde?—The works on the Ouse and the Nene, include the making of their banks parallel, but there is no sea bar or cross current of tide at their outfalls; the same I have already said as regards the Clyde.

4375. Do both those rivers discharge into the Wash?—Yes.

4376. Is there anything of a cross tide in those instances?—No.

4377. I believe you have reported upon Lynn harbour several times?—Repeatedly.

4378. And there has been a considerable reduction of the level there as the result of those works?—I think in 1838 or 1839, I was applied to by the Corporation of Lynn, as their engineer, to determine whether Sir John Rennie's great plan of embankment was likely to be beneficial or otherwise to Lynn harbour, and I made a very elaborate investigation of the state of the tides, by which I found that the ebb tide at Lynn was not so low as the ebb tide four miles below in the Wash, by 4 feet 6 inches, and that the flood tide was not so high by some inches; and therefore, when the new channel now just opened was proposed, I advised the Harbour Commissioners of Lynn to make a considerable money contribution to that work, on the ground that it would give them from four to five feet more tide at the town quays.

4379. So far as regards the question of the tidal column maintained at Lynn, is there any difference in the application of the principle which are applied in that case and in the Tyne, so far as they are parallel?—Certainly not.

4380. I understood you to say the other day, in answer to a question by my learned friend Mr. Seymour, that anything which was beneficial to Newcastle was beneficial to Shields. Is it possible that you might have a good state of navigation up to Newcastle, and a bad state of bar at Shields?—That would be possible; you might have a very good deep channel up to Newcastle, and a very small quantity of water passing in and out over the bar, and in my judgment as a consequence, a bad condition of bar and sea entrance.

4381. Then to that extent, so far as regards the question of the state of the bar and the entrance to Shields harbour, and the question of the navigation up to Newcastle, they are distinct cases?—Distinct in that respect.

4382. I understood you to say, in answer to my learned friend's questions to-day, that you did not think that the works which had gone on upon the Tyne up to the extent to which they had gone in 1849, had injured the state of the navigation?—That they had not injured the sailing channel, but have in some parts benefited it.

4383. From the evidence which you have given to-day, on a comparison of the 19,000,000 cubic yards of water which would go with the Tyne, assuming the capacity should be reduced in the way which was suggested with the 29,000,000 cubic yards that went in in Rennie's time, in your opinion, would that lead to a determination, if not of the navigable channel, at all events of the bar?—I have said so. You cannot afford,—at all events it would be the height of engineering presumption,—to make so large an abstraction from the Tyne before you had ascertained by works at the bar that you could afford to loose such a large proportion of the tidal backwater.

4384. You explained the other day, I think, that these transverse full tide jetties produced a considerable irregularity as regards the currents?—Yes, in curves particularly.

4385. As a matter of economy, in your opinion is it proper to build full-tide jetties with reference to connecting them afterwards with longitudinal walls?—Such jetties are in themselves economical, and rapidly made, and if the object be to get the portions of the shore between them rapidly silted up, such groins are an economical mode or means of accomplishing it. The objection I have always felt to them is, that owing to the rapid manner in which they reclaim the shores, they commit the Commissioners to the plan of whole tide-walls. I can see no economy in them, so far as the future building of the whole-tide walls between their heads is concerned. I cannot understand how that is to be shown.

4386. Then is the real question this, that full-tide jetties may be regarded as a very proper structure for making land, but are not a proper structure for making walls with reference to conservancy purposes?—Inasmuch as the whole-tide jetties rapidly reclaim the spaces between them, but which in the meantime constitute a series of what has been called "bulbs," they are not to my mind proper conservancy works, either as regards the future or the present, if acted on as a rule instead of as an exception.

4387. You have referred to a silting which you say takes place at the foot of full-tide

J. M. Rendel, Esq.
12th Feb. 1855.

and quay walls; to what is that due?—You will find in most cases a counter stream along the face of a high-tide wall when there is a strong stream running in the middle of the river, and in cases where the stream carries much sand or mud, you have, as a consequence, a trifling deposit in the eddy at the foot of the wall.

4388. Is that silting which you find at the foot of quay walls, in your opinion due to the diminution of velocity from the friction along the walls?—Yes; to the eddy caused by them.

4389. As comparing full-tide walls with half-tide walls, is there an absence of such deposit in the latter?—I have never found it to anything like the same extent.

4390. As a matter of abstract theory, full-tide walls will propagate the tide perhaps better than half-tide walls?—No doubt.

4391. Do you know whether, as a matter of practice, there have been any observations made which enable you to ascertain whether practice agrees with theory upon that point?—No, I do not. The breaking of waves over half-tide walls has the effect of preventing the growth of deposits.

4392. But as a practical question, you do not apprehend that the difference would be very considerable?—I do not. As regards the scour due to river or land floods, it is clear that there would be no difference in their beneficial effect whether the channel had whole or half-tide walls.

4393. Then, so far as regards the question of land water, the half-tide walls in the Tyne would be quite sufficient?—Quite.

4394. I think the proportion which you gave in millions of tidal water over the bar to land water was about 29 to 1?—As 1·7 to 29.

4395. (*Mr. Brunel.*) Comparing the mouth of this river with the mouth of other rivers down the east coast, have you looked lately at the mouth of the Wear at Sunderland with the piers as constructed?—Yes.

4396. Upon looking at the chart of that, which we have here, the tide and the currents caused by the tide run north and south across the mouth, exactly as they do off the mouth of the Tyne, I think?—Yes.

4397. There are artificial piers carried out there pretty nearly to the same distance, but if anything the northern pier rather the furthest?—Yes.

4398. What has been the effect there?—I do not know of my own knowledge.

4399. I see another small river near the Tyne, which, although small, would have exactly the same operation and action as a large river, namely the Blyth, of which here is the chart. That river runs out from the shore almost due north and south, and therefore directly opposite to the principle which is proposed of constructing the southern pier of the Tyne projecting beyond the northern?—Yes.

4400. If you look at the chart of that river, there will appear to be no bar at all?—I should call this (pointing to the chart) a very considerable bar.

4401. Imagine a vessel following the direction, and a pretty straight one, which I have marked there, is it not one continued regular increase of depth?—I cannot say so.

4402. Is there not one regular steady increase of depth, beginning at 1, 2, 3, 4, and going on at 7, 12, and 20?—No, I beg your pardon. Inside I see two feet—here (*pointing to another part*)—whilst there is only one foot across this, which is evidently the bar.

4403. That is the only difference?—But two to one is a very considerable difference in such a case. Besides, here (*pointing to the chart*) you have not a high headland or pier at the north side of the entrance but only a low reef of rocks. Now I contend that the action of the sea over this reef in northerly gales, as well as the tide as soon as it has covered them, by falling into the channel parallel to the reef, is quite sufficient to account for its maintenance. To justify a comparison with the Tyne, you must suppose a high-tide pier built over this low reef of rocks.

4404. (*Mr. Seymour.*) May I suggest, Sir, the case of the Humber?—I am so intimately acquainted with the Humber, that I suppose I could find my way about it in the dark. I should say it is a totally distinct case as regards its form of entrance and tidal economy.

4405. (*Mr. Seymour, through the Chairman.*) As to what you said with regard to the rise of tides at Newcastle in Mr. Rennie's time, did I rightly understand you that the tide did not rise so high at Newcastle as at Shields in Mr. Rennie's time?—No. I said that according to my recollection of Giles' survey, made for the late Mr. Rennie, the tide rose at Newcastle to the same level as it did at the Low Lights, but that I found in 1849 from Comrie's tidal observations, it did not reach the same level at Newcastle by about, I think, five inches.

4406. Have you examined the section of 1813?—I have not.

4407. Have you referred to this section?—No; I never saw it before. The only plans of Mr. Giles sent to me by the Corporation were the original plotted soundings and sections; and I recollect most distinctly (and I will find it, if it be a matter of importance) that Mr. Giles states that he found a tide which rose 15 feet, I think, upon the Low Lighthouse, rose to the same level at Newcastle Quay. Now, whether it rises at Newcastle 8 inches more or 8 inches less is a question almost entirely dependent, as it appears to me, upon the state of the wind at and previously to the time of observation.

(*Chairman, to Mr. Macartney.*) I have handed to you privately our Commission. Having seen that, do you wish to tender yourself to give evidence?

Mr. Macartney.) I had intended to request permission to give evidence upon an application which I made, or a question which I put to Mr. Wilson connected with the Tyne. According to your Commission, upon my request I do not think you can receive me; but you seem to say that the other parties may ask for me to be examined. *J. M. Rendel, Esq.* 12th Feb. 1855.

(*Mr. Webster.*) I will ask Mr. Macartney a question, Sir, with your permission, certainly.

GEORGE MACARTNEY, Esquire, M.P., examined. *G. Macartney, Esq., M.P.*

4408. (*Mr. Webster.*) I think your attention has been directed for some time to the state of things in the Tyne?—Yes.

4409. You were Chairman of the Tynemouth Dock in 1852?—Yes.

4410. Some representations having been made to you respecting Messrs. Palmer's encroachments on the Tyne, were you led to make inquiry of Mr. Wilson of the Treasury on the subject?—In consequence of a communication, I think, from the Shipowners' Society or somebody at North Shields, I was requested to put a question as to the encroachments by Messrs. Palmer, in consequence of a grant, as had been stated, from the Commissioners of the Tyne. I put the question to Mr. Wilson, and his answer was, that it was only for a temporary purpose. He took, I think, four days to answer.

4411. (*Chairman.*) Have you any personal knowledge of encroachments in the Tyne?—Yes; I had an opportunity of going down in a steam-boat to examine with the old charts and the new charts the condition of the river some time subsequently to this question being put.

4412. (*Mr. Webster.*) Was the representation made by Mr. Wilson in answer to that question which was put in the House of Commons that the encroachment was only temporary?—Certainly; "for a temporary purpose" was the expression.

4413. This was an application which you made in consequence of a memorial or statement from the Shipowners Society?—I think it was the Shipowners Society—some public body at North Shields.

4414. Do you remember the Tynemouth Dock being opposed by the Commissioners, both before the Admiralty Surveyor and in Parliament?—Yes.

4415. The Admiralty Surveyor, I think, was Mr. Hawkshaw?—Yes.

(*Chairman.*) We have nothing to do with that.

(*Mr. Webster.*) You will find, Sir, that it has a great deal to do with it.

(*Chairman.*) You are not now going to the Jarrow Dock, I hope, because we decided at Newcastle that anything which has already become Act of Parliament, we have no power of impugning.

(*Mr. Webster.*) It is with reference to the conduct of the Commissioners, and the efficiency of the Commissioners, Sir.

(*Mr. Seymour.*) It was thrown out by the Commons, who exercised their discretion upon it, upon the evidence of the promoters.

(*Chairman*). What I wish is to understand clearly what bearing this has upon the inquiry, or whether it comes within the scope of the Commission.

(*Mr. Webster.*) I think so, Sir; at all events it will come within the scope of the question, whether the Commission has worked efficiently.

4416. (*To the Witness.*) That was a dock, I believe, substantially the same as Mr. Brooks had recommended in 1845?—Certainly, as far as my examination of all the documents, when I became chairman and wished to satisfy myself that I was not going counter to what was considered the duty of the conservancy of the Tyne. I satisfied myself that that dock and plan by our engineers, Messrs. Locke and Errington, were upon the principles laid down in 1845 by Mr. Brooks.

4417. Mr. Brooks, then the engineer of the Commissioners, having recommended a plan of a dock like that, did you anticipate opposition from him or at his instance?—No; the principal opposition was from the Ordnance. Finding at the Admiralty that the great pressure was from the Ordnance, and not from the Admiralty, I had a communication with the Inspector-General of Fortifications, and, in consequence of his recommendation, I went down to Shields and met Captain Moody, who had first reported against our proposition as interfering with Ordnance property.

4418. That I believe was arranged?—I spent four hours, I think, with Captain Moody upon it, and on my return to London, and he having received my assurance on the part of the Company that our object was to meet the public service in every way, I received an assurance from the Ordnance that our arrangement was satisfactory, and that we should go on.

4419. Mr. Brooks, I believe, appeared before the Inspector in opposition to this dock?—I was not present.

(*Mr. Seymour.*) This complaint about this Tynemouth Dock has never been opened against us, Sir.

4420. (*Mr. Webster.*) So far as you know, was there any authority from the Commissioners, or were any of their funds applied to this opposition?—I have seen it in print; that is all I can say.

4421. Do you know at whose instance, or of which party among the Commissioners,

G. Macartney, Esq., M.P.

12th Feb. 1855.

this opposition to the plan, which was substantially the same as Mr. Brooks had recommended in 1845, was promoted ?—No, I cannot say it of my own knowledge.

4422. Do you know whether there was any resolution of the Commissioners to that effect ?—I saw a copy of a resolution to that effect; I cannot say whether it was a correct one.

4423. I believe one of the grounds of the opposition urged on that occasion was, that all works in the nature of dock works ought to be postponed until these piers, then in progress, were completed ?—Until the question of the piers at the mouth of the river was definitively settled—it was one of the grounds for preventing us going on.

4424. Did you know at that time what I call the secret correspondence, which was going on between Mr. Walker and Mr. Brooks and Mr. Clayton with reference to the piers ?—No, I had not heard of it then.

4425. In April 1853, it appears that a correspondence was going on which you were not then aware of ?—No.

4426. So that when this opposition took place in Parliament, you did not know what was the state of the question as regards the piers ?—No.

4427. And as regards the correspondence ?—No.

4428. I believe an application has been made to the House of Commons, upon your motion, for the production of the correspondence ?—Of all the correspondence since a certain date.

4429. Do you regard it as material to the interests of the Tyne, and to affording information before this Commission, that the correspondence with reference to those piers should be before them ?—I should say so, certainly.

4430. (*Mr Seymour.*) That is without knowing what the nature of the correspondence is ?—I know pretty well from some I have seen printed.

4431. (*Mr. Webster.*) Have you seen a print of part of it by Mr. Walker ?—Yes.

(*Chairman.*) I may say that we have got the correspondence.

(*Mr. Webster.*) Then, Sir, I must just ask you to have the goodness to let Mr. Evans inform us what you have, because you will remember how this matter stood ?

(*Chairman.*) He shall compare it with what you have.

(*Mr. Webster.*) At Newcastle I asked Mr. Clayton for certain correspondence—he put in some. It then turned out that there were other letters which he had not put in.

(*Chairman.*) The best way is for you to compare yours with ours.

(*Mr. Webster, after a short interval.*) This you have not. Mr. Walker informs Mr. Clayton that there is a correspondence with Mr. Brooks, of which he has a copy which will account for the employment or loss of time that has passed, and that is part of the general correspondence which you have not.

4432. (*To the Witness.*) Have you a copy of the resolution of the House of Commons ?—I have of the motion I made, and the same altered at the Admiralty, and granted as an unopposed motion. This is the one I put on the paper on the Thursday, and here is the one which I adopted.

(*Mr. Webster.*) "Copies ordered of all correspondence connected with the construction of certain works at the mouth of the river Tyne, between the Admiralty, the officers of the Tyne Commissioners, Messrs. Clayton and Brooks, and Mr. James Walker, Civil Engineer, since the 24th February 1853." Now, Sir, I am told that you have probably all the correspondence with the Admiralty; that you have part of the correspondence, as since published by Mr. Walker, which has only come to our knowledge since we were at Newcastle, but that you have not as yet any of the correspondence of Mr. Brooks or of Mr. Clayton, excepting so far as Mr. Walker has disclosed it.

(*Mr. Clayton.*) Perhaps I may save a little time by giving one portion of information. Mr. Walker informed me that two letters which had passed between him and Mr. Brooks, copies of which he had sent to the Admiralty had been sent without his authority to this Commission, and that he had withdrawn them; that he had written to the Admiralty to to say that he had not authorised their being sent. With that exception the whole correspondence is before this Commission. If those two letters, if they have been sent to the Admiralty, are returned to this Commission they will have the whole matter before them.

(*Chairman.*) We stand in this way: we informed you in the first instance that we had determined not to go into the question of the piers at all, thinking it beyond the scope of our inquiry; but upon a subsequent consideration we determined to go into it so far as to hear any objections which might be made to those piers as compared with other piers, and you have heard Mr. Stephenson's evidence, and Mr. Rendel's evidence to-day and previously, each of whom prefers his own construction to the other. But the case stands thus, that the Admiralty, with whom the question rested more than with our Commission, had already accepted Mr. Walker's piers, and the whole thing was actually settled, and entirely accomplished, short of commencing the work. I do not see, as at present advised, (if you wish to have the room cleared in order that I may take the opinion of my colleagues upon the subject, I will) that we can go into that correspondence of Mr. Walker. I imagine that the whole thing is entirely settled; that the Admiralty is satisfied, and therefore that we have no business to interfere at all in the matter.

(*Mr. Webster.*) Sir, you have used an expression which I believe is strictly correct, though, perhaps, it might appear presumptuous in me to say so; you have said advisedly

G. Macartney, Esq., M.P.

12th Feb. 1855.

that the Admiralty have accepted Mr. Walker's piers. I believe they have given an acceptance in order to save the conditions of the Act of Parliament which requires that the piers should be commenced within two years. But as far as regards any approval, or any question (which is most material) of the mode of execution, or the way in which they are to be conducted, the Admiralty, if that correspondence is to be adhered to, have given nothing like an approval in any way; they had done the barest act that they could so far as regards arrangements, in order that the conditions of the Act of Parliament which required that the piers should be commenced within two years, should be complied with. If this correspondence of Mr. Walker's, so far as it has become public is to be relied upon, it shows that anything like an efficient prosecution of the piers is, perhaps, further off than ever it was. And, Sir, this matter has assumed a new aspect since the meeting of your Commission, for you have had memorials as I am told from the Shipowners Society, founded very much upon facts which have come to the public knowledge since your Commission met, which certainly will lead to a further inquiry before this Commission upon the subject of these piers, and upon the subject of the way in which the Tyne Commissioners generally have conducted themselves in reference to these piers, and you will find that the question of these secret committees in connexion with this pier question will become one of the substantial matters upon which I apprehend you will have to give your judgment in your final report. And if that which fell from the learned Recorder of Manchester the other day, that you had nothing to do with the constitution of the Commission, should really be your opinion, then, in order that the results of this Commission may not be almost futile, it certainly will be necessary that there shall be an additional motion made in the House of Commons, and a further address to Her Majesty that your powers may be enlarged to a certain extent.

(*Chairman.*) That is another affair.

(*Mr. Webster.*) Facts have come out since this Commission began which affect most materially the question of the constitution of the Commission, and the remedy which you must apply to a state of things, which certainly it is highly inexpedient should continue in the Tyne.

(*Chairman.*) I think, then, we will clear the room.

(*Mr. Seymour.*) I hope, Sir, before the Commissioners come to any decision connected with my learned friend's statement, as this matter has been introduced at the end of his case, and, in fact, comes upon me very much by surprise, the Commissioners will allow the Chairman, or Mr. Clayton, to explain what has taken place since with reference both to Mr. Walker and the prosecution of the piers.

(*Chairman.*) If we decide to inquire further, of course that will be the best thing to do.

(The parties were directed to withdraw, and after a short time were again called in.)

(*Chairman.*) You will recollect, Mr. Webster, the determination which we came to, that we would receive no evidence except that which had a strict relation to the piers themselves; whether any other piers might be preferable to them, or whether there should be no piers at all: and that we determined not to go into any questions of private correspondence. My colleagues and myself are entirely agreed about that. We decline to receive any of the correspondence between Mr. Brooks and Mr. Walker, or any of the papers to which you have referred. We shall call Mr. Walker to-morrow, and we will then hear his own vindication, if I may so speak, of his piers in preference to other proposals which have been made; but we entirely decline going into any private correspondence, or any letters which have passed on subjects, whether relating to pecuniary matters, or to the merits of the piers. We expect that Mr. Walker will be here at 12 o'clock to-morrow; and we have also thought of calling Mr. Murray, who was the engineer of the Sunderland piers, to hear his opinion upon them. That will conclude all the evidence to be brought before us. After Mr. Murray has been examined will be the proper time for Mr. Seymour to make his remarks upon the evidence which has been taken since we came to town, and then on the 1st of March we hope that Mr. Webster will be prepared with his final speech.

(*Mr. Seymour.*) Perhaps, Sir, you will leave open to me the option of summing up either immediately after Mr. Murray's evidence, or before my learned friend in March.

(*Chairman.*) I think it would be better if you agreed together to make one day of it, on the 1st of March.

(*Mr. Webster.*) I have not the least objection.

(*Mr. Seymour.*) I was going to ask the Commissioners whether they are bound to the 1st of March, or whether the 3rd or 4th will suit them equally well. The York Assizes come on upon the 1st of March. I should like to be present during my learned friend's reply. Perhaps you will leave it open until to-morrow, Sir.

(*Chairman.*) Yes, we will settle it to-morrow. Our object for naming the 1st of March was that Mr. Armstrong said he could not be here before that time, and we were glad to take the first day on which he could be present; but if there is a strong wish on the subject we will not adhere to it.

Adjourned till to-morrow, at 12 o'clock.

Friday, 16th February 1855.

J. Walker, Esq.

16th Feb. 1855.

JAMES WALKER, Esquire, examined.

4433. (*Chairman.*) YOU were at Newcastle and employed on Tyne in they year 1852?—I have no doubt you are correct as to date. I have been so frequently upon the Tyne that if you will be kind enough to let me know what particular business you refer to, I shall be better able to answer as to the time.

4434. You held an inspection in the year 1852?—Yes; on the subject of the piers.

4435. Will you be so good as to give us your opinion upon the state of the Tyne, as a navigable river?—My inquiry, as I have said, regarded the piers.

4436. But I apprehend that you went down the river, and had an opportunity, as a professional man, of seeing more or less what the state of the river was, and under what course of improvement it appeared to you to be?—The answer which I can give to that question must be general. I believe the river above Shields harbour has improved; but I have not been employed professionally by the Tyne Improvement Commissioners to give an opinion upon the improvents of the river generally.

4437. But you were of opinion that it would be a great improvent to the general navigation of the river if outer piers were constructed?—That I have no doubt of. The great difficulty at present is that of ships entering during storms, and this is increased by a bad bar. My decided opinion is, that the formation of piers would be a very great improvement in these respects; and I think I may say that this opinion is universal.

4438. With respect to the upper part of the river, you have not entered into the question or observed it sufficiently to qualify you to give any decided opinion upon the subject?—I must decline giving a professional opinion on that part, not being sufficiently acquainted with it. The Commissioners of the Tyne Improvement, by whom I have been employed in other matters, never consulted me on their operations upwards. They have, I presume, had confidence in their own engineer, and probably he was not anxious to be interfered with.

4439. (*Mr. Brunel.*) With reference to the point to which you have just referred, are you aware of the system which has been followed in the works on the Tyne?—Yes, generally, from having read the evidence occasionally; then I consider also that the improvements in the lower part of the river are not altogether unconnected with the piers; because I can suppose operations to be carried on in the river which would neutralize very much the good effect which the piers are intended to produce, and will produce, if fair play be given them.

4440. To what works in the river do you specially refer?—What I refer to now is the abstraction of water by the Jarrow Slake Dock, and still more by the abstraction of the the whole lake, also by the Hay Hole Dock and other abstractions.

4441. That is to say, if the whole were abstracted?—Yes, the whole or the principal part of the lake.

4442. Do you think that the abstracting of the whole of Jarrow Slake would be prejudicial to the entrance of the river?—I do, and to Shields harbour. I have always said so, and I have also, in the House of Lords, stated that the good effect of the piers would in my opinion be counteracted to an extent, if Jarrow Slake were allowed to be abstracted.

(*Mr. Webster.*) That is question 624, Sir.

(*Mr Walker.*) I do not know any engineering question on which my mind is at present more decided than it is upon that. I have looked at the slake with reference to three schemes at different dates; first, when a small quantity was proposed to be abstracted for the formation of docks; then, a second time, when a larger quantity, but still only half the present dock area, was to be abstracted, upon which I reported to the Admiralty that docks would be a great improvement to the port, but I recommended that the question and principle of backwater should be attended to, and I stated at the time, although the quantity was comparatively small, the mode in which I thought the parties should respect the principle.

4443. (*Mr. Brunel.*) You are aware that some portion of Jarrow Slake is about to be enclosed for the purposes of docks, under an Act of Parliament?—I am; that is the inquiry which I referred to, and upon which I gave evidence in the House of Lords.

4444. Are you aware of how much of Jarrow Slake will remain unaffected after the construction of those docks under the Act?—I think there will be about 230 acres remaining; it appears that about one-third is to be abstracted by the proposed dock measure —that is the maximum. The effect of it will depend also upon the river line which the parties mean to adopt, and whether they facilitate or render more difficult the entrance of the water into Jarrow Slake.

4445. You say it will depend upon whether the coustruction of these docks will render it more difficult?—Yes, partly so.

4446. Do you think it important, in designing the piers for the entrance of the harbour, that you should be thoroughly acquainted with the existing state of the river

J. Walker, Esq.

16th Feb. 1855.

within, and with the works which are proposed to be constructed in that river?—No; I do not think so, to the extent you name. I consider the piers are a separate work from the river; but I repeat that the operations of the piers when made will be affected by any works which shall diminish the tidal water; if you diminish the quantity of water passing through the piers, you diminish the sectional area necessary to pass it, and therefore you allow a shoaler bar to form; if again you increase the quantity, the tendency is to deepen the bar.

4447. Then, whatever might be the works executed within the river, whether beneficial or prejudicial, generally speaking, they would not affect the plan which you would adopt for the construction of the piers?—No, they would not; always subject to the above observations.

4448. With respect to the system which has been followed, and which it is proposed to continue in the river Tyne, you are aware, probably, that the system which has been adopted has been that of running out high-water tide groins to a settled line, which we will call the river line, to allow the deposit to accumulate between those groins, and then to construct a half-tide wall, retaining that deposit, and gradually to raise that half-tide wall up to full-tide, and either allow the shore to accumulate up to high-water mark, or artificially to raise it to high-water mark. I believe that is according to the evidence, the system which has been determined upon for years past in the Tyne, and acted upon; do you consider that that is likely to be beneficial to the river, or would you recommend that the training walls should be only half-tide walls, and the tide allowed to flow beyond them, and not to raise the groins to the full-tide? What is your opinion between those two modes?—The question involves a good many propositions, which I must endeavour to separate. I think that, in the first place, the question is, whether what Mr. Brunel calls the river lines are such lines as are well suited for the purpose, not going too far into the river. Now, without knowing at all what those lines are, I cannot answer the question, as regards the particular works which are being done in the Tyne; but I will presume that they are good and proper lines, and I shall answer the question upon that assumption. Then my opinion is, that the mode which Mr. Brunel has referred to, and which, therefore, I do not repeat, is the proper way for improving the navigation in the upper part where the river, as a navigation, depends upon the land water chiefly, and not upon the tidal water, and that carrying the walls thence only up to half-tide level might deprive the public or the owners of the use of that ground, whilst the high-tide walls would make the reclaimed ground useful for wharfs and other purposes of commerce. But in the lower part, where the effect depends upon the tidal water, I think that the walls should be low, so that while they guide the direction of the stream, the tidal water should be allowed to ebb and flow over them. Another reason is, that at the lower end of this river you get into parts where ground is of less value for wharfs and other commercial purposes; and, therefore, the tidal water should not in that part be abstracted. The river Clyde is an illustration. I have, since the death of Telford, been the consulting engineer to that river, which is always adduced as one of the rivers wherein the greatest improvements have been made by art, and the principle which I am now naming is what has been carried out there under my advice, and the lines for walls and dykes have been laid down accordingly. The upper part being contracted so as to give the land waters the full effect of scour; but towards the lower part somewhere about Erskine Ferry, ten miles below Glasgow, we have regard to the quantity of tidal water. And there the sloping walls or dykes are not raised higher, generally speaking, than half tide, and no tidal water is abstracted. I should say, therefore, that in the upper part of the river Tyne, for the reasons which I have named, it would be a pity not to take advantage of carrying full-tide walls, but that lower down, where the tide is the great agent upon the harbour and the bar, it is wrong to abstract the tidal water. I have here a plan of the river Clyde, with my lines, the Parliamentary lines, laid down upon it. So far as the works have been executed, they have been followed, with one exception made by advice of the then resident engineer, and the trustees now find that this was a mistake, which they are endeavouring to rectify. If you choose to have it laid upon the table, you will see the principle which I have named. (*The same was produced.*) The upper part of the river I consider to depend upon the land floods, and it is very easy to show that here the quantity and velocity of the tidal water is small compared with the energy and quantity of the land floods for scouring out the river. The one has a velocity of perhaps triple the other. Therefore, and for the purpose of trade also, the plan has been to confine and regulate the width. But when we get down below Erskine Ferry, the dykes are not to be raised much above the level of the sand, and the tidal water is allowed to spread over the whole of the natural width. This does not so much improve the portion immediately opposite the particular place; but its tendency is to avoid damaging the river and estuary lower down. The quantity of tidal water is what scours the lower part and keeps it clear. Now the lower part of the Clyde I consider to be, in some degree, similar to the Tyne opposite Jarrow Slake. The Commissioners will see the lines marked upon the plans; the space between them is the navigable channel, but the dykes on each side of this part have not been raised and connected so as to exclude the tide. That is the principle upon which I have acted in all cases, and I cannot see how a difference of opinion on the subject can be entertained.

J. Walker, Esq.

16th Feb. 1855.

4449. (*Mr. Seymour.*) How high are the walls which are in existence as far as they have gone?—So far as they have gone here, they are, I believe, but little above the level of the sand.

4450. Are these walls above the level of low-water mark?—Some of them are.

4451. How much are they above low-water mark?—Various heights. We have in the Clyde to encounter private owners, and we have to humour them. There is one part opposite the property of a noble lord, where on the south side the dykes are not yet put down, and for many years the trustees have been endeavouring to agree with his lordship, always understanding that the dykes should not be raised above the level of the sand. If I am asked to point out a particular place where a wall is built, or where it is not, I cannot be expected to answer that. Mr. Ure, who has, I understand, been examined, could have informed you.

4452. Can you say whether the sand is above low-water mark?—In some places it is, and in some it is not. Perhaps the following passage from my report will best explain my meaning:—"Relative effects of land floods and tide water.—Mr. Whidbey's "opinion appears to have been founded upon the idea that the Clyde up to Glasgow "depends chiefly upon the tide, I think otherwise, and that the sectional area of the "river nearly as for down as dredging is wanted, is caused by, or is the effect of the land "floods, much more than of the tide water. I do not say that the latter is useless, or "that it ought not to be encouraged, but only that comparatively it is of less consequence "for scour than the land waters. I believe that the velocity of an ebbing tide may be "taken at a mile and a half an hour near the harbour. Now the fresh I saw ran "4½ miles per hour, and at that time it had subsided 2 feet from the height at which it "had been during the night. Evidently such a scour must have much greater effect than "the tidal current of a third the velocity and much less height, and if this be not sufficient "proof of the soundness of the plans that have been pursued, it is not necessary to go to "other rivers for illustration (although there are many), but only to compare the Clyde as "it is, with the Clyde as it was before the operations began when the tide had its full range "of width. Lower down the river, where the river is wider, the land floods became of less "importance than the tides, and therefore it is that the tide ought to be the chief object of "care, and that I have recommended the dykes being kept down, so as to prevent as much "as possible a diminution of the tidal water."

4453. (*Mr. Brunel.*) The supply of land water on the Clyde is rather large, is it not?—The freshes are very sudden and reach very high; at other times the supply is but small.

4454. As compared with the Tyne, should you say that it was very much greater than in the river Tyne, or not?—I think it comes down more rapidly than in the Tyne; probably you have correct information as to whether the area of the drainage into the Tyne is greater or less than in the Clyde; but the velocity in the Tyne during a heavy land flood is, I understand from Mr. Brooks, very considerable, so much so that, as in the Clyde, the rise of a neap tide does not change the current.

4455. About where should you draw the line on the river Tyne, between the part which you think should be devoted more particularly to the effects of the land floods, and the part that might be called the estuary of the Tyne?—As the Commissioners never consulted me on the subject of the Tyne generally, and as I have not given sufficient attention to it, it would be wrong for me to endeavour to point out the particular part where the one terminates and the other begins. The tidal effect increases gradually as you descend, but I cannot answer the question as to the particular place.

4456. You know the Tyne pretty well?—I have said already that I have never been consulted by the Tyne Improvement Commissioners to look at the Tyne generally. It would be folly to commit myself to a matter which I have not sufficiently attended to.

4457. You have expressed a very decided opinion with respect to Jarrow Slake, nevertheless?—Yes. I am very decided with respect to Jarrow Slake, considering that the point to which I refer, as the turning point between tidal and river water, must be above Jarrow Slake. I have read part of the evidence which has been given before you, as to the water of Jarrow Slake being carried higher up if excluded from Jarrow Slake, which, I confess, has surprised me.

4458. You are aware that there are several wide places in the river not very far above Jarrow Slake, which at present afford a considerable space for tidal waters?—Yes.

4459. Up to Hebburn Quay we will say, for instance?—Yes, I presume so.

4460. Would those various bays immediately above Jarrow Slake, and we will say, without being very precise, up to Hebburn Quay, come, in your estimation, under the class of spaces for tidal waters which ought to be preserved?—Will you allow me to look at the plan? (*The Witness referred to the same*).

4461. Between there and Hebburn Quay are two or three large spaces, which were formerly, and many of them are still covered with water at high water. Would they come within the distinction which you made of a tidal estuary, as compared to a land-water river?—I should think probably so; the ground being reclaimed is probably valuable. I do not know to whom it belongs. I understand there are full-tide groins and half-tide longitudinal walls, it being intended afterwards to fill up the space between them; it certainly seems a large quantity to abstract; but, perhaps, the ground may be very valuable after it is reclaimed, and its value may go to the improvement of the Tyne in

another way. I do not know the fact. The depth of water over those places is, I understand, on the average 8 or 9 feet at high-water spring tides. I would ask whether tidal docks or recesses could not be made in these bays, to prevent the total exclusion of tidal water, without much diminishing the mercantile value of the property?

4462. Abandoning, for the moment, the mercantile value of the property to the individuals (although, of course, to a certain extent, an increased value of property is beneficial to the nation), and looking at it merely as a question of Conservancy and river navigation, should you attach much importance to those spaces being left?—Yes, I should. Keeping out of sight those considerations which you tell me to keep out of sight, I should not let those spaces be reclaimed by a full-tide wall. I state it with the condition, as I say again, that it may be that the value of the ground may be applied again to improve the river in another way, as by dredging. The way that we have made the Clyde what it is, has been done entirely by the dykes and by dredging getting rid of shoals. If that is to be applied, it may do more good than the abstraction of that particular place may do harm; but Jarrow Slake is a very much more important space than any space much higher up the river is. A great deal has been said about the Narrows, and the quantity of water going through the Narrows, from which it has been inferred that the water which now goes into Jarrow Slake through the Narrows would go up the river. If I am correct in supposing that that opinion has been held, I have no doubt in the world, and I think my friend on the left (Mr. Brunel) will agree with me, that it is fallacious. I consider that the quantity of water which goes up, is just that which is due to the receptacle or void that is to be filled, and that if you diminish the receptacle, you diminish the velocity or the depth, or both, of the water passing through the Narrows. If again, you were to enlarge Jarrow Slake and the river above it, so that the quantity of water, in order to reach high water, should be double what it now is, you would have a greater velocity through the Narrows, which would tend to enlarge that contracted place, and a greater quantity of water would pass through the Narrows to fill the supposed enlarged receptacle. There are many rivers which are very much parallel cases. It is quite evident, I think, that if I were to stop the river water going up by a dam across the river a few miles above the Narrows, the velocity of the water passing through the Narrows would be very small, as it would only have that small space to fill, whereas if the receptacle to be emptied and filled at each tide were enlarged, either the velocity or the sectional area throughout the Narrows, or both, would be increased.

4463. Admitting the undeniable correctness of your assumption, that if you increase the quantity of water going up above, it must pass more rapidly, and therefore more efficiently, over the Narrows, I presume that it would be even better still, or at all events equally beneficial, if that increase took place higher up the river, as if it took place by an enlargment down at Jarrow Slake?—No, I do not agree with that as a general proposition; it depends upon how high up the river the enlargment might be. In the first place, my reply to that is, that both are best. To say, that because you are going to improve the river in the upper part, for the benefit of those upper interests, therefore you may do a corresponding injury down below, is, I think, bad policy and bad reasoning.

4464. I do not raise the question of policy, but I put it merely as an engineering question, and a physical fact. Will the scour in the Narrows be equally benefited by the same quantity of water going up and down for a considerable distance up the river, as it will from that same quantity of water going in and out of Jarrow Slake?—As regards the river, it will be more improved, the same quantity of water going through the Narrows by going up as to Newcastle; but as regards the bar and Shields harbour, I think otherwise.

4465. Will you have the goodness to explain why?—Because Jarrow Slake or any other part low down may be at such a point as that there is a large volume of water to be discharged at once, and so as to reach the Narrows and the bar at what the Admiralty surveyors state to be the best time of tide; the whole quantity of this water may pass off together; it is, as it were, let loose on the bar with the greatest effect; whereas if this same quantity of water were passed up the whole length of the river, it must come down, doing good all the way, but occupying a larger space of time in passing out, and therefore, as respects the harbour and the bar doing much less good than if it had been received and discharged from Jarrow Slake or other place not far from the entrance. Therefore I say, that I find, when I get below Jarrow Slake, a river which is very much larger and deeper, called Shields harbour, than what is above it; and I consider the difference to be the effect of the greater quantity of water from the sea passing up to that portion of the river which is below Jarrow Slake, than what is above it, and returning again with an ebbing tide.

4466. For that reason, if Jarrow Slake were higher, it would produce still more effect?—I will suppose Jarrow Slake to be considerably higher; take it, if you please, ten miles up the river.

4467. You may assume it so, but I would rather assume it below Newcastle Bridge?—Then I should say that then it is in a very good situation for improving the river, but by no means so good a situation for improving Shields harbour and the bar; it should just be in that position in which it assists and adds to the greatest velocity of water passing over the bar during an ebbing tide.

4468. From Jarrow Slake the water must run over the bar during the first of ebb,

J. Walker, Esq.

16th Feb. 1855.

must it not?—I think it is stated by the witnesses who have surveyed it, and taken the velocities, that it goes off at one quarter ebb, and reaches the bar at about half ebb, at which time the effective velocity upon the bar is stated to be the greatest. I do not give it as my own evidence, but as what is given by the Admiralty nautical surveyors.

4469. The effect of the scour of the water from Jarrow Slake would depend, I presume, very mainly upon the period at which it flowed over the bar?—I have said so.

4470. You are aware that the mud at Jarrow Slake is at least above half-tide?—Yes; the average is, I believe, about half-tide.

4471. Therefore, all the water must have flowed off it, principally during the first third of ebb?—I have said so.

4472. Are you aware what difference of time there is between the tide at Jarrow Slake and the tide over the bar?—I have stated from the authority of the surveyors, that they consider the water to leave Jarrow Slake at a quarter ebb, and to reach the bar at half ebb, and that is the period of time at which they say it produces the greatest velocity; they say it is from three to four miles per hour at the bar.

4473. Do you remember where that evidence is?—I had it in my hand this morning; I think it is Mr. Calver's evidence.

4474. You have qualified your opinion of the disadvantage to the river, by reason of the enclosing of lands, by saying, that if the increased value of those lands returned in any way so as to assist the works of the river, the advantage might be greater than the disadvantage?—I have, as respects the enclosures upwards.

4475. If it did not return at all towards the improvement of the river, of course that countervailing advantage would not exist, and would your opinion then be unqualified that it was undesirable for the benefit of the river to have full-tide walls?—That would be as regards full-tide walls, still I think it would be desirable to train the river, and to confine the navigable channel, as I have shown is done in the Clyde, by low walls, rubble dykes.

4476. I need hardly ask then, whether, if the filling of the ground behind was even a source of expense to the navigation of the river, it would not, in your opinion, be still less advantageous?—Certainly.

4477. With respect to the position of the piers outside Tynemouth, will you have the goodness to explain to the Commission the particular objects which you had in view, and which you supposed would be attained by the position of the north and the south pier, and their relative lengths. You are probably aware that opinions have been expressed before the Commission, as to the advantage or disadvantage of having a north pier, or as to the extent to which it ought to be projected as compared with the south pier, and as to the effect upon the channel between the Narrows and the piers of the particular position of the mouth between the piers. Will you have the goodness to explain to the Commission your opinion of the advantage of the plan which you have recommended?—I, in the first place, must say that I am not aware of the evidence, excepting from hearsay, to which Mr. Brunel refers, having been given by any individual with regard to a modification of my plan. I have not seen any evidence given before this Commission on the subject, with the exception of Mr. Stephenson's.

4478. It has been suggested, that the flood-tide producing a current from north to south, and the ebb tide producing a current from south to north, the mouth of a river in this position should artificially, if it is not naturally, be turned towards the north, so as to receive the effects of the southward current on the flood, and to join with the effects of the northward current on the ebb, and that therefore such a northern pier should not be constructed at all, or that the southern pier should project beyond it. Without referring to any particular plan which has been proposed with that view, yet considering that view, will you have the goodness to state your reasons for recommending a northern pier, and a northern pier which should project about as far as the southern one?—The whole object of my coming here this morning, as I expected, was the subject of the piers, and when Mr. Brunel asks me to state my reasons for the particular plan which I have recommended, I beg to say, that they are better explained in the printed report which I hold in my hand, which was made to the Tyne Improvement Commissioners, than I can do now. I have read a passage from my report on the river Clyde, which I think explains my notions about half-tide walls, and so on, better than my vivâ voce evidence did, but as to going into the merits of my own plan of the piers which is before me, I confess that I was not aware that the particular formation of the piers was to be a subject to be discussed before this Commission. I am ready, however, to go into it as far as an unprepared witness can do.

4479. Do you consider that by a north pier preventing the north and south flood-tide current from entering the river so freely, such a projection will diminish the amount of tidal water that will enter the river Tyne?—My decided opinion is, that practically it will not. The velocity of the flood tide, if I recollect rightly, does not exceed something like a mile and a fraction per hour, and with respect to the obstruction to its entering, the tendency of water is, as the old saying, to find its level. I cannot understand that, if an opening be made sufficiently large to pass all the water which is necessary for the river Tyne, either in its present state or what I hope will be its improved state, including Jarrow Slake, the water will be at all throttled by passing through the opening which I have supposed of 1,100 feet in width between the piers, when at the Narrows it is not much more than half that width. The velocity and quantity of water entering between

J. Walker, Esq.

16th Feb. 1855.

the piers and going up the river, depend, in my opinion, entirely upon the void or space to be filled and the freedom of passing, as I have said already, when speaking of Jarrow Slake. The direction of the current of the tide outside these piers has, I think, nothing to do with the quantity entering; even if the current of tide were directly in the line of the fair course between the piers, and also greater than the velocity due to the draught inwards, that is, to the void or space to be filled, because the velocity, after passing the piers and before entering the Narrows, would be reduced to what is due to the latter cause, and the momentum of the force outside the piers would practically be lost in the space between the piers and the Narrows. I speak of velocity only, the height or head outside the piers is quite a different matter, and does not depend on the form or position of the piers. If, therefore, there is no impediment formed by piers with the mouth which I have described, I think, as regards what is a very important object, namely, the facility of ships entering, it is very much better that a ship having approached the piers should enter close to the windward pier, and shoot through them at once into a clear wide space, and be out of danger, than that the one pier should project before the other, particularly a pier which would with the action of the tide in a north-east wind, have a tendency to send a ship to leeward against the south pier, after her head had got within the north pier. My object in the piers which are before you is, that a ship entering should hug the windward pier, and with the 'way' upon her, pass by both piers before the wind and tide should drift her stern to leeward against the south pier. You are perhaps aware that I went into this question very fully when named by the Tyne Improvement Commissioners, and appointed by the Admiralty to do so. I had as many as a dozen different designs given me for piers. I have given the subject great consideration, and looking at the plan which is now before me, I do not see that I could improve it. An objection which may be made, and which I quite agree may at first sight be fairly made to it is this, that there is a space between the Narrows and the piers, in which the outgoing stream would be at liberty to take a crooked course, and to form shoals and irregularities. But when I see that at present the ebbing tide, after passing the Narrows, goes out as far, or nearly as far, as my proposed piers, without such irregularities, although at present its course is not directed or confined by piers, but is open to the cross tide, yet that the current is sufficient to keep a nearly straight channel, I cannot understand how it is possible if I form a north and a south pier, and thus exclude the whole of the cross tidal current, and confine the river current within piers, the piers can increase that devious tendency, but I think it will rather diminish it. Again, even assuming this not to be the case, if you have taken the trouble to read my report, you will have seen that I have provided (if it should be necessary) for training the channel in the space between the Narrows and the pier heads, which may be simply done, not by walls, which would I think be dangerous in that situation to a ship running in during a storm in the direction of the channel, and not under command of her helm, but by means of low rubble dykes laid at a long slope, and mixed with wooden rods, faggots, or other material, which in case of emergency a ship might touch without damage, which would soon get sanded up. I do not, however, think they will be wanted; I should also, if required, dredge out a fair channel for receiving the above materials.

4480. (*Chairman.*) You would make an artificial sand bank, in fact?—Just so; the sand would get into those faggots and mix with them, and there lie; you may form a channel any way you please in that way. I have named that in this report. But my opinion for the reason which I have given is, that it is not necessary, and I name faggots only as one of the ways.

4481. (*Mr. Brunel.*) With respect to such a bank of training wall faggots as you speak of, have you any experience that you can refer to where such banks have been made, and resisted the sea very successfully?—Here there would be no sea to resist.

4482. But even if there were?—I name Dover harbour; we are using them exposed to the sea, not exactly in the way this would be done, but as groins; the object there is to keep the shingle up against the town, and I see the same is being done by the South-eastern Railway Company for a similar purpose. I repeat that that is the only objection as far as I know which can be made to the formation of those piers, and I name how, if it should ever operate, it may be met. We should consider that inside those piers we are not at sea, but that the object is simply to train the outgoing current, and to prevent its wandering out of its straight line.

4483. The objection with respect to a possible meandering of the stream inside those piers, I should mention, was rather on the supposition that it would be produced by the incoming tide, although the stream outwards might also, of course, wander through the channel so made. Do you think that with an opening at right angles to the current which is passing outside with some very perceptible velocity from north to south, the influx of that water would immediately take place in a direct line from the mouth of that pier to the Narrows at right angles to its original direction?—I do. It would be at right angles, undoubtedly; just the same as if I were to open a cock or a pipe at right angles to the direction in which the water was going, the water would immediately take the rectangular direction.

4484. Supposing there was no pipe, but a simple aperture in the side of another pipe through which the water was flowing at considerable velocity, would the water come out

J. Walker, Esq.

16th Feb. 1855.

of that aperture at right angles to the main pipe? Coming back to the original case, assuming the aperture between the piers to be at right angles to the current of the sea, and that the water in the sea is passing it at a velocity of a mile and a quarter an hour, and that the head of water would produce two miles an hour in an upward direction towards the river, would not the flow of the water within those pier heads be in a south-west direction (not due south-west, but considerably southerly of west), about in the proportion of the one and a quarter to the two?—The question put by Mr. Brunel is, whether the water would not go somewhat in that direction (*showing the same*). I think the water, after entering, will not have such southerly tendency as to be practically felt. The velocity of water entering will be considerably greater. With the tide running in a southerly direction, the water may have a little devious course, as I am now drawing my hand upon the plan, but it will necessarily and quickly come back and go into a straight line, and take the course of the greatest velocity.

4485. (*Chairman.*) Why should not the north pier turn a little more inwards, by way of giving a straighter direction to the tide coming from the north, instead of running out at almost right angles with it? Something in that way (*describing the same*)?—Here is a north-east wind. We should open this space between the piers to the sea if we carry the south pier beyond the north, which is very different from the scheme of one of the witnesses, who, as I understand, carries the north pier further out than the south. Then, if the wind is in this direction, you will see that when a ship comes round close to the windward pier she has to pass the lee pier afterwards, and she must have the whole length of this point from the entrance of the harbour before she is clear of the leeward pier. In the way that I have drawn it here, the two being opposite to each other, she passes both at the same time, and the outgoing current also is kept in the straightest direction until it passes the bar, and is carried out to fall in with the ebbing coast tide; whereas, in the other way, you get space which is wider than I have drawn it; and there would be a tendency to deposit and to form a bar at the end of the short pier.

4486. Your principal object, therefore, is to obtain an increased amount of shelter?—And to add to the facility of ships entering, and also to keep a direct, thorough straight channel until I get outside the piers. I have shown by these two dotted lines (*showing a Sketch*) my notion, in case of any vagaries of the stream, how it may be confined; and you will see that a great part of it would be upon the sand above low water. It is quite evident that, without danger of any kind, a something might be put down here, which would prevent the erratic action of the water. I think there will be an inclined plane from the pier heads down nearly to the straight line of the passage.

4487. (*Mr. Brunel.*) A training wall, particularly if made of faggots, might be carried along nearly two thirds of the length between the Narrows and the pier head without increasing the danger to the shipping at all? It would be like the present sand bank?—Yes; it would be a sand face, as it were; but it would be a sand face which would not be removable; and it might be made so as to have a little elasticity in it, which would rather assist the ship than otherwise. But I wish you again to understand that I do not lay much stress upon that, because I do not think there would be any occasion for it; and, therefore, I have merely hinted at it in my report. I do not there name faggots, because I do not think training would be at all wanted; but I now name one of a variety of ways in which I think the object may be accomplished.

4488. The works of the south pier have, to a certain extent, commenced, have they not?—To no extent that can be called so, more than a beginning.

4489. Have not preparatory works commenced; quarrying?—There is some quarrying done at the Trow Rocks. By the Act of Parliament, the Commissioners were obliged to begin the works by a certain time, and they have just done that. They have made a beginning. A length of ashlar foundation course is also laid upon the north side.

4490. (*Chairman.*) And are you aware that land is purchased?—A purchase has been made from the Dean and Chapter.

4491. (*Mr. Brunel.*) What have you bought land for from the Dean and Chapter?—It is not my buying, and I did not approve of it as regards the money given for it; but that was no business of mine. The Commissioners have purchased, I understand, 36 acres of rock.

4492. It is rock, I suppose, which you required to be bought for the work?—I did not approve of the price. I think it ought to have been got cheaper.

4493. Could you get stone cheaper elsewhere?—I cannot say; it lies extremely convenient, and may be worth all the money that was given for it, and more, to the Commissioners; I believe it to be so. I suppose I must not say one word against the Dean and Chapter. It, however, appeared to me to be an enormous and unreasonable sum to ask; and I think I so stated in writing before the purchase was made.

4494. Were there any Parliamentary powers for purchasing land for the piers?—I cannot answer that question.

(*Mr. Clayton.*) Yes, there were; it was within the Parliamentary powers.

4495. (*Mr. Brunel, to Mr. Walker.*) I have nothing more to ask you. Perhaps my questions may have led you to wish to say something upon some of the points yourself; and, if so, will you have the goodness to do it?—Mr. Rendel submitted a plan for piers, and he gave evidence to me, and I understand that he has given evidence here, on what I may call, by way of distinction, my piers. Gentlemen who have read this report will see that

I have paid every proper compliment to the engineer to the Commissioners, Mr. Brooks, and the plan which I have recommended is on principle similar to one of the three plans which he gave in. I have not seen Mr. Rendel's evidence before this Board, and therefore I cannot answer his objections.

(*Chairman.*) We do not call upon you at all to give any opinion as to Mr. Rendel's piers, or as to his reasons for naturally approving of his own piers in preference to yours or anybody else's; so that, I think, we need not trouble you to go into that.

4496. (*Mr. Brunel.*) Do you think that it would be better or worse to proceed first with the south pier, and then form the north pier, and run it out more or less according to what experience might point out as best?—I think that it would be desirable to go on with both piers, as far as the Admiralty powers will enable that to be done, and without delay.

4497. With the view of finishing both as soon as you can?—Yes; I think, and have said, that the putting up the inner 500 feet, and that only of the north pier, would be a mistake, because I do not think that the 500 feet would do anything useful; and I think it would be better to go on with the foundation of the north pier as far as the Admiralty will allow it to be done, because it ought to have time to consolidate before anything can be put upon it, which the 500 feet, being upon a rock, does not require.

4498. (*Chairman.*) And the south pier you would go on with?—As far as the Admiralty powers would allow.

4499. (*Mr. Brunel.*) Without reference to the Admiralty powers, if you had your option as to the manner in which you would proceed with these works (of course in all large questions of this sort the means of proceeding will not enable you to do all at once) would you rather proceed with the south pier to the full extent, and then go on with the north, or would you proceed with them both at about the same rate, so as not to hope to derive any particular advantage from the one or the other until both were finished to the full extent?—I should endeavour to keep the two going on together, believing that it will not be a perfect work until both be done.

4500. (*Captain Fitzroy.*) Referring to the north pier as a whole work, you regard it, I believe, principally as a means of sheltering the approach to the Tyne; the principal object of the north pier is for giving shelter?—Both are for giving shelter, and both are also for the purpose of carrying the ebbing river tide to such a distance as would join the ebbing coast tide, and carry the bar away from the mouth of the piers. To state my reasons for the plans, would be to read the whole of the report which is before me. I ought not perhaps to omit this; I was going to state the opinion of a gentleman whom every individual round this table must know, and of whom all have but one opinion, if it would be proper for me to state the opinion of another person at all with regard to those piers; am I at liberty to do so?

4501. (*Chairman.*) Anything you like?—I refer to the hydrographer to the Admiralty, Sir Francis Beaufort. After I had made my report I showed him the twelve plans which were given in to me; Captain Washington was present. He, the Admiral, examined all of them, and then said, "That he did not say it might not be possible to make even a "better plan than mine, but that he had seen nothing so good, and that he did not "see how it could be improved."

4502. (*Mr. Clayton.*) That was Admiral Beaufort?—Yes.

4503. (*Captain Fitzroy.*) When at Tynemouth, standing close to the point near the Lighthouse, the harbour-master, Mr. Wake, remarked that the first of the flood set very strongly round the point close to the rocks all the way round from the Lighthouse to the Spanish Battery. Assuming that his assertion was correct, do you see no occasion of injuring or of impeding the flow of the tide into the harbour by projecting a pier in direct opposition to that first flow of the tide?—I do not; I see no objection at all to it. The effect will certainly be to alter the stream both of the ebb tide and of the flood tide, and to concentrate the whole into one straight line from the pier heads outwards, increasing the velocity of the tide at the mouth of the piers. The change I allow, but the change I consider will, both as respects the flood tide and the ebb tide, be beneficial.

4504. Then you look to the filling of the receptacle, the basin of the tide as the effect of statical pressure outside the piers alone, without any assistance from the tidal impulse from the body of water in motion horizontally?—I do, except as regards the ebbing tide when the water from the harbour and from the bar will be joined by it. I think I have expressed my opinion fully as to the receptacle or void.

4505. It was referring to the flood tide at that moment only. In shutting off the effect of the lateral impulse of the flood tide as it comes along shore from the north by the proposed north pier, you look to the filling of the reservoir as the effect of the rise of water outside the piers, and the level of the water within the piers; you look to that effect solely for filling the reservoir, without any reference to the lateral tidal impulse of the body of sea water?—Entirely; and I consider the tidal impulse to be the effect of the same cause; this I transfer to the pier heads. I think that the tidal direction is caused by the void which the whole space of the river Tyne forms, and that the tide takes the shortest way, going round the Spanish Battery and the Lighthouse, of getting into it. If you were to put a dam across and prevent any water coming into the Tyne at all, or into that space which is between the Tyne and the Spanish Battery, you would have no tidal current

J. Walker, Esq.

16th Feb. 1855.

going in. The current inwards is the effect of the void. I transfer the inlet to the pier heads and collect it there.

4506. (*Mr. Webster.*) You have told Captain Fitzroy that you regard the filling of this space as simply a question of water entering that orifice from the pressure outside and the void within?—Yes.

4507. I think in a part of the evidence which you gave before the House of Lords, with reference to the abstraction of the Jarrow Slake, you said that if the water excluded from Jarrow Slake should go higher up, it must be attended by a considerable rising of the general surface up to Newcastle?—"If"? it all hangs upon the "If."

4508. In your opinion, if the water should go higher up than Jarrow Slake, would it not produce a reflex action, in consequence of it at the minimum section at the Narrows, which would exclude a portion of tidal water otherwise coming in through your piers?—Yes. The gallant Captain was not in the room when I stated what I beg now to repeat. I think that the improvements above Jarrow Slake may be important, and that their tendency is to produce the effect (I do not say to the same extent) which the advocates for them and for the exclusion of Jarrow Slake contend for; but what I maintain is this, that if Jarrow Slake be kept open, and those improvements upwards also made, the water coming in through the Narrows, and therefore going out again through the harbour to the bar, will be what will be due both to those improvements and to Jarrow Slake.

4509. You said that you had selected this plan, which was substantially Mr. Brooks', out of about a dozen?—I beg to refer to my answers already given as to this.

4510. I observe that in your report, at page 11, referring to the different plans, you say this:—"At the same time I am desirous to do justice to their authors, and have, for "the better enabling me to consider their various features, had the whole drawn out to "the same scale, a copy of which, and also of my notes containing the substance of the "evidence taken by me, can be sent to you if you desire it." You address that to the clerk of the Commissioners?—Yes.

4511. Probably the Commissioners never asked you for that?—I take it they asked me for the short-hand writer's notes, because they printed them.

4512. Not of this. I am not speaking of your Inquiry in 1852 upon the piers; I am speaking of an Inquiry which you held in 1853, I think partly in London and partly at Newcastle, or Shields, upon these plans of Mr. Brooks'?—It was upon all the plans.

4513. At all events I am speaking of the time when you selected these. You say in your report of the 15th of November 1853, which is addressed to the Commissioners—"I have had the whole drawn out to the same scale, a copy of which, and also of my notes, "containing the substance of the evidence taken by me, can be sent to you," that is, the clerk of the Commissioners, "if you desire it"?—Yes.

4514. That, I apprehend, has not been sent to him?—The plans have not been sent to him certainly, for he never has asked for them.

4515. Nor the notes of the evidence?—No.

4516. Were you the Inquiring Officer upon the part of the Admiralty on the 1st of March 1852 (the proceedings on which Inquiry are printed) into the then Parliamentary plans of Mr. Brooks and the Commissioners for piers?—Yes.

4517. I think perhaps this will recall it to you. Do you remember Mr. Clayton saying something to this effect before you. The plans which were then before you were the Parliamentary plans of the Session of 1852, and Mr. Clayton said, "At the same time "I ought to mention, that if Mr. Brooks had had his own way, he would have drawn the "northern pier from the point of the castle beyond Prior's Haven; that is not the Com-"missioners' line, but it is the line which Mr. Brooks their engineer would probably have "preferred. I thought it due to Mr. Brooks, to make this statement. The Commis-"sioners have laid down the line which, in their judgment, they deem to be the best"?—Yes.

4518. That took place before you in March 1852, at the Queen's Head, Newcastle, upon the Inquiry?—Yes. I presume you are quoting correctly.

4519. It was upon the Parliamentary plans which the Commissioners had selected, and as to which Mr. Clayton said, that if Mr. Brooks could have had his own way, he would have preferred to have taken it beyond Prior's Haven?—Yes, I believe so.

4520. In your report, when you went down subsequently in 1853 to examine into this plan of Mr. Brooks, which you say you selected?—No. I do not say I selected it alone; there were other plans besides Mr. Brooks'. I have the whole of the plans here, which (with one exception) I have no objection to show. They will enable the Commissioners to see Mr. Brooks' three plans, and also the difference between all of them and mine.

4521. You said that you had paid a proper compliment to Mr. Brooks and the Commissioners, and that you had selected his plan out of about a dozen; that was your answer just now. I will just ask you to look to the following paragraph at page 11 of your own report. "At the same time I am desirous to do justice to their authors and have, "for the better enabling me to consider their various features, had the whole drawn out "to the same scale, a copy of which, and also of my notes containing the substance of the "evidence taken by me, can be sent to you if you desire it"?—Yes.

4522. As I understand it, the clerk to the Commissioners, or the Commissioners, never asked you either for a copy of this plan, on which all the plans were drawn to the same

scale, or of the substance of the evidence which on that last occasion was taken before you?—No, I think not.

4523. Have you any objection to furnish that to the Royal Commission?—I have said that I have no objection, but on consideration, I doubt whether I should not give offence to some of the authors of those plans, by now laying them before this Board without their sanction.

(*Mr. Seymour.*) I merely oppose this, Sir, upon the ground of its violating the rule which you laid down, and going into irrelevant subjects.

(*Chairman.*) We will not go into this.

(*Mr. Webster.*) Then, Sir, am I to understand you also, as saying that you think it immaterial to have before you the notes containing the substance of the evidence taken by Mr. Walker, upon which he selected this plan? Mr. Walker has said that he regarded this question of the north pier, and of piers generally, as very important with reference to vessels coming in; in point of fact, he very much adopts the opinion which Mr. Stephenson gave, namely, that he considered these piers of vast importance, as a question of a harbour of refuge.

(*Mr. Brunel.*) No; a harbour of refuge is another matter.

(*Mr. Webster.*) Now, Sir, you would find, if you had these notes before you, that the question, so far as it was before Mr. Walker, was very much more a question of vessels coming in than a question of navigation and the improvement of the river generally; and, therefore, one important question which you will have to consider hereafter is this: it may be that these piers would be very good as a nautical question, so to speak, and with reference to vessels coming in and obtaining shelter, but that they would be very inexpedient standing alone and without reference to inner works, and also without reference to what works were to be carried on in the upper part of the river. I say, therefore, Sir, that if you are to be in a position to form any proper judgment upon the whole question submitted to you as to the effect of these outer works upon the navigation of the river, you ought to have before you the substance of the evidence upon which Mr. Walker selected these piers.

(*Chairman.*) If you wish me to clear the room, and take the opinion of my colleagues upon the point, of course I will do so; but speaking for myself, Mr. Walker had recourse, of course, to all the means in his power of forming the best opinion. I do not think that we are called upon to search into all those means; he comes here himself to say that after the fullest consideration which he could give to the matter, his piers are the piers which he prefers, and we have no business, I think, to examine into all the particulars which led him to arrive at that conclusion.

(*Mr. Seymour.*) Upon the same principle, Sir, your notes might be asked for by some future Commission.

(*Mr. Webster.*) You see, Sir, it is a copy which Mr. Walker tenders to the Commissioners.

(*Mr. Brunel.*) To those Commissioners, not these Commissioners.

(*Mr. Webster.*) Just so, Sir, and which, if it had been accepted, would have been among their documents, and might have been laid before you.

4524. (*To the Witness.*) In selecting these piers, did you select them upon your own responsibility, (I use that expression, because the Admiralty use it in their letter of the 6th of May,) and do you recommend them as an engineer, or did you select them with reference to the evidence which was given before you as the best of the twelve designs which were submitted?—Certainly, and entirely on my own responsibility as an engineer.

4525. I think you say that within these piers you apprehend there will be comparatively still water?—If I used the term "still water," I made a mistake; but it would be comparatively calm water.

4526. I understood you to say, that within those piers there would be comparatively quiet water?—Yes, compared to what there would be outside.

4527. In fact, one of the expressions which you used was that there would be no sea to resist there?—Yes, no sea.

4528. Do you apprehend that within those piers, and out of the channel which you have spoken of, the sand would have any tendency to grow up?—Yes; at the sides, not in the channel.

4529. Would it grow up, do you think, to a considerable extent?—Against the piers I think it would.

4530. Probably it would make a space which would be useful for vessels to beach upon in case of distress?—Yes, it would do that; but vessels would do much better to go on.

4531. That is to say, if there was water enough to take them up to Newcastle?—Yes; they had much better beach upon that than beach upon the rocks.

4532. In regarding the quantity of water which will pass near the aperture of those piers, do you apprehend that the velocity of the flood tide will at all affect the amount?—It will affect the velocity, and the amount of what passes outside the pier heads. The velocity outside, per se, will not affect the velocity or amount inside the piers; but the height of the tide outside the piers will affect the velocity and amount inside the piers.

4533. As those piers are arranged, the orifice for the line of the current going in is nearly at right angles to the flood tide?—Yes.

4534. Will the amount of water which goes in be affected or dependent upon the amount of the flood tide passing nearly at right angles across the entrance?—Very little, indeed. I have said so.

J. Walker, Esq.

16th Feb. 1855.

4535. So that, in point of fact, it is, as you told the Commissioners, practically the filling of a bottle, and, therefore, the amount which enters will depend upon the amount of internal area or volume to be filled?—Yes, entirely so, unless there be a stricture to prevent the water from entering. As I did not think of the effect of the question, I did not at all interrupt Counsel or the learned Commissioner in what he said with regard to the direction of the flood tide; but the direction of the flood tide would not be at that part at right angles to the direction of the pier. I hold in my hand a plan which shows the direction of the flood tide, and which the learned Counsel will see is at a considerable angle from the pier heads.

4536. (*Mr. Brunel.*) Which way do you think it will run when the pier heads are made?—When the pier heads are made, the current, until it passes the south pier head, will be nearly at right angles to the direction of the pier.

4537. (*Mr. Webster.*) When the piers are constructed, the current of the flood tide will be nearly at right angles to the direction of the entrance?—Yes, which is not the same at it is at present.

4538. You have said that you regard the state of things, when these piers are made, as the filling of an internal receptacle, and that therefore the quantity of water going in will really depend upon the amount of that receptacle?—Yes; and therefore I trust the Royal Commissioners will not lend their assistance to diminish that receptacle, but rather to increase it, if practicable. The diminution of the slake already sanctioned by Parliament for the proposed dock, will have a tendency to the silting up of the remainder of the slake, and therefore it may be equitable to ask the dock proprietors to take measures for maintaining the present depth over the 230 acres that will remain.

4539. (*Mr. Brunel.*) What do you mean by "that receptacle"?—The receptacle formed by the river generally, including Jarrow Slake, and the recesses and bays.

4540. (*Mr. Webster.*) Within what time do you apprehend that those piers, as they are proposed, could be executed?—Am I to suppose that there is no want of money?

4541. You have recommended these piers to the Admiralty, with a knowledge of the state of the finances and the funds upon which they are to be provided, and I ask you whether you have any opinion as to the time within which they will be finished?—The premises which the learned Counsel proposes to me are not correct. I was not aware of the fact that money was at command in any shape or way.

4542. These piers were projected as the best, in your opinion, in an engineering point of view, and without reference to the means which were at the command of the Commissioners for carrying them out?—Yes.

4543. Have you had occasion to look over the evidence which you gave in the House of Lords on the Jarrow Bill since you gave it?—Yes; I have this morning looked at one answer which I gave.

4544. I need hardly ask you whether, so far as you know, you adhere to the opinions which you there expressed?—I cannot answer, excepting as to the one which I referred to. It seemed to me to be the most important of any of the answers which I gave, and therefore I looked at it this morning. The number of the question is 617.

4545. Have you any reason to change the opinions which you expressed there?—No. About one passage in that answer I must say that I am anxious; it is the finishing one, and to which I have referred this morning. "I am glad to have this opportunity of re-
"cording my opinion, and as the designs for the Tyne piers, which are just begun, were
"made by me, to say, that if Jarrow Slake be abstracted, the effect will be to diminish
"the sectional area of the river between Jarrow Slake and the bar, the harbour (Shields'
"harbour) will be diminished in width and in depth, and the good effects proposed by the
"piers lessened."

4546. Will you now refer to question 624? has anything occurred since to change the opinion which you there expressed?—This is a short answer, and I will read it with the permission of the Commissioners. The question put to me by a noble lord was this: "Are you speaking of the present scheme, or the scheme of 1847?" That was with regard to the abstraction of water. "The present scheme would be, according to the
"measurements which have been given to me, one twenty-second of the whole river." His lordship says, "The whole river?" and my answer is this, "Yes, the whole which passes
"over the bar on the ebbing of the tide. I hope your lordships understand the principle
"which I have always advocated, and with respect to which I have my report upon the
"river Tay now lying before me. Then it is to be observed, that the effect of abstraction
"is not in a simple ratio of the quantity, but more nearly as the square of the quantity.
"If, therefore, the whole of Jarrow Slake be abstracted, and I cannot help thinking that
"the way the matter has been looked at will, if followed up, lead to that; if that be
"done, the quantity will be one-eighth; and therefore the effect would be in a much
"higher proportion. Now, as I have said in my report on the Tyne piers, that their
"effect will be to deepen the bar, I consider the exclusion of Jarrow Slake will have the
"effect of diminishing the good effect which the formation of those piers will have, unless
"means be taken to prevent it. I do not think compensation can be given above Jarrow
"Slake, but I think it ought to be given below in the harbour, the part to be damaged."
That last part refers to the Admiralty proposition, which was, that the railway company should be obliged to deepen above Jarrow Slake. I did not agree in that. I think it should be below Jarrow Slake.

4547. I think it was your opinion then, and probably is so now, that the abstraction, even if it should improve the river to some extent above, would certainly injure it below Jarrow Slake?—Yes. I do not mean to say that it would not improve it in some degree above; the operations which the Commissioners are carrying on are, I presume, improving it very much upwards, but it should be improved both ways. I do not think their improving it above Jarrow Slake for up-river purposes, should entitle them to injure it below Jarrow Slake.

4548. (*Mr. Seymour.*) You mean operations above Jarrow Slake?—Yes.

4549. (*Mr. Webster.*) Will you look to question 641, and read it?—The question put to me is this: "Will you tell me to what extent the water may be raised up to Newcastle "by reason of cutting off these diversions in Jarrow Slake and other places?" and my answer is, "I should say (but their lordships should know that it is a speculation) a foot "above its present level, supposing the river to be regulated for its whole length up-"wards; and I may also add, that to compensate for the whole quantity taken from "Jarrow Slake, if you exclude that, it will require the water at Newcastle to be "raised 10 feet." That seems enormous when I look at it now, but I have considered this a good deal, and I know what the effect of improving the Clyde has been as to raising the water, and I do not believe that the Tyne at Newcastle will be raised more than, or so much as, a foot by any improvements which can be made.

4550. (*Mr. Seymour.*) I presume that the tendency of the erection of the south pier will be to cause a silting up of the sand in the enclosed area?—Yes; I have said so; in the enclosed area out of the channel.

4551. As that sand consolidates and silts up, will not it have a tendency to form a natural bank, so as to assist in directing the current of the ebb?—Yes.

4552. You have told us of reasons for that north pier, and the benefits which you expect to be derived from it as to ships making for the harbour under a northerly gale, or beaching upon sand in preference to solid masonry, and also as to having a quieter water inside. Will not outward-bound ships likewise derive benefit from the shelter given by that north pier?—Undoubtedly.

4553. In clearing the pier heads?—In clearing the pier heads, they will be in comparatively quiet water until they reach the pier heads, and then the current will join the tidal current of ebb tide. The direction of the ebb tide out of the harbour will not be very much altered from what it now is, excepting that it will be carried further out.

4554. Then the two principal benefits are the effect of sheltering vessels either making for the harbour or going out of the harbour, and also the effect of so guiding the current of ebb as to get it out into deep sea, and in fact to get the bar out into deep sea by training the current further out?—Yes, and I hope diminishing the bar, that is the great object of it. In a harbour with which I have had to do for many years, we have removed the bar altogether; that is Great Yarmouth.

4555. I believe a large portion of the ebb tide now goes over the rocks abreast of the Spanish Battery?—Yes.

4556. That body of water will be directed then into a truer channel?—No doubt, into a straight channel.

4557. I presume that in the event of vessels requiring steam-tugs to go out to their assistance, they would be able better to get out?—Certainly, steam-tugs could lie very nicely inside the piers until the time of their choosing to shoot out for the vessels.

4558. Are steam-tugs very generally in use upon the Tyne?—Very much so; and another class of vessels, that is to say, screw colliers, are very much in use, and are getting more so.

4559. Is not the per-centage of steam vessels, whether as tugs or colliers, very much in excess of those vessels which are propelled by sails?—The increase no doubt is. I have had occasion in the river Thames to look into that subject a good deal this Session of Parliament, and it appears that a great quantity of the trade of Shields or of Newcastle is now being carried on by steam vessels. One good effect of it will be, to improve the river Thames, the navigation of which is now so much encumbered by colliers lying in the stream to unload.

4560. Has not the per-centage of steam-tugs employed in towing vessels up the Tyne very much increased?—I understand very much.

4561. And do not vessels generally use steam-tugs?—Yes; I speak to the best of my knowledge; if I am not correct there are many gentlemen here to correct me.

4562. Your attention has been called to a long answer which you gave to question 617 in 1854; I will just read the following passage, and ask you whether you entertain the same opinion now:—"The principle that excluding water from Jarrow Slake is to do "good, will apply more to a total than to a partial abstraction, under the notion that a "proper river wall line would send the water higher up the river. Now, I agree that "the effect would be that somewhat more water would come up and return, and that there-"fore the river would be somewhat deeper in that part. I also agree that the tidal water "would reach its summit or point of high water sooner than it now does; but these my "lords are general principles." Do you adhere to that view as to general principles?—I do.

4563. The answers which you have given with reference to Jarrow Slake are, I presume, based upon the assumption that when the works are carried out, both there and upon the river, there will be an abstraction of the tidal water which enters the Tyne?—Not upon an assumption, but in my opinion, a certainty.

J. Walker, Esq.

16th Feb. 1855.

4564. I do not say an incorrect assumption. In giving your answer, you first state it as your opinion that there will be an abstraction, and then you argue upon the effect of that abstraction?—Just so.

4565. May not a lateral abstraction of water from the Tyne be compensated by a deepening of the receptacle of the tidal reservoir in the river. Taking the river as a whole, if you increase its capacity as a reservoir for tidal water, may not you thereby compensate for a lateral abstraction of the tidal column?—Yes, you may do so; but what I say is this: Taking me for a moment here as representing the public, I quite agree in what you say, but I do not like the word "compensation." I say again, if in order to improve the river upward you choose to make contractions and half-tide walls or whole-tide walls, you have no right, because you do a good there for up-river purposes, to do an evil at Jarrow Slake.

(*Chairman.*) I think we had better refer to matters of fact, instead of putting hypothetical questions.

4566. (*Mr. Brunel.*) I understand the learned Counsel to ask you whether an increased bulk of tidal water in another part might not compensate for a diminution of tidal water in Jarrow Slake?—Yes, it might.

4567. (*Mr. Seymour.*) Suppose that state of things to take place, and that there was a depression of the low-water surface of the river, would it be a sign that the capacity of the river as a tidal receptacle was improved?—Yes.

4568. Can you say whether that is a fact or not in the Tyne?—I do not know it as a fact, but I believe that all those contractions will deepen the low-water; but they may, notwithstanding, be an abstraction from the quantity of water which goes out over the bar; they are chiefly confined to the improvement of the particular parts opposite to which they are made.

4569. (*Mr. Brunel.*) It was not the deepening of the bottom which the learned Counsel referred to, but the lowering of low-water mark, and consequently the leaving of a greater space to be filled next tide between that low-water mark and the high-water mark?—The cause which Mr. Brunel has named, will operate in the way which he describes, and that will be beneficial in every way. You are aware of the general position which I put early in my evidence, which is this, that in order to benefit the bar, or Shields harbour, the addition which you make to the quantity of water should be at the time of the greatest velocity of the tide over that particular place. If I had my choice, I should, as respects the harbour, like to put Jarrow Slake a mile or two higher up, upon the principle which I name, so that I should be nearer the time of half-ebb when the water from Jarrow Slake should pass over Shields harbour.

4570. (*Mr. Seymour.*) As far as I understand my case, we agree in saying that the same object would be attained, we have no right to take away one thing in order to benefit another. As a matter of fact, at present, the tide has a full range below Jarrow Slake; the range of the tide has not been interfered with by any works of the Commissioners below Jarrow Slake?—No, not yet, that I am aware of. They are making, I understand, a very large enclosure just opposite Jarrow Slake; I wished to have had the plan of it before me, but from Mr. Brooks being out of the way, Mr. Clayton was unable to let me see the plan of the river till this morning, and then it had neither the Jarrow Slake nor the Hay Hole docks upon it.

4571. I have understood you all through your evidence, to guard yourself from entering minutely into the condition of any particular points upon the river. I think you said that your whole object in coming here was to give your evidence in regard to the piers, and that your attention had been directed more particularly to that matter. Am I to gather from that, that you have not compared the recent survey by Mr. Comrie with the surveys in 1849, or previous years?—No, I have not.

4572. (*Mr. Webster.*) I should like to put one question, Sir, upon what my learned friend has asked. Is it your opinion, as I understand my learned friend to assume, that the water which is to be excluded from Jarrow Slake will go into the upper parts of the river?—No, it is not. I think the two have nothing at all to do with each other. If Jarrow Slake be kept open and the river improved, the water coming in through the Narrows will be sufficient to fill both; but if Jarrow Slake be excluded, the quantity going up will only be that to fill the river.

4573. (*Mr. Brunel.*) I understood you just now to say, that attaching value as you do to the effect of the tidal water over Jarrow Slake, you think that the same area and the same depth placed a little higher up would be even more beneficial?—Yes. I do not think so, so much as regards the bar to which I think in the former parts of my evidence I alluded, but it would be more beneficial as regards Shields harbour.

4574. But not as regards the bar?—Not as regards the bar. I speak, as I named, very much from the survey of Mr. Calver, who says, that at present, the water from Jarrow Slake reaches the bar at the half-tide, which he describes as the time of the greatest velocity.

4575. Would it not be better still at three-quarter ebb?—Not so; if Mr. Calver be correct, it is a matter of observation, that depends entirely upon when the greatest energy of the ebbing tide is; Mr. Calver says, "half-ebb."

4576. (*Mr. Seymour.*) Will you permit me to ask one question, Sir, as to floods. Have you ever observed the effect of land-floods in the lower part of the river?—No. I am quite ignorat as regards the works which are doing in the line of the river.

JOHN MURRAY, Esquire, sworn.

J. Murray, Esq.

16th Feb. 1855

4577. (*Chairman.*) Are you the principal engineer at Sunderland for the improvements which have taken place there?—I am at present the engineer of the Sunderland Dock Company; previously I had been engineer to the Commissioners of the river Wear and Harbour of Sunderland.

4578. Have you any personal knowledge of the river Tyne?—I have a general knowledge of it.

4579. From what date?—Since the year 1832.

4580. Have you been professionally employed there at all?—I have.

4581. Under whom?—The Corporation of Newcastle were the parties who employed me.

4582. They were at that time the conservators of the river?—Yes.

4583. Have you kept up your knowledge of the Tyne from that time down to the present?—I have, in a general way.

4584. Will you be so good as to give us your opinion of the state of the Tyne when first you were acquainted with it as compared with its present state as a navigable river?—I could not answer the question without knowing the whole of the soundings and comparing the state of the river at present with what it was at that time. I can state this, that when I first became acquainted with the Tyne it was full of sand banks; and I have been frequently aground upon those sand banks in steam-boats, which I have not seen to be the case latterly.

4585. Then you consider that an improvement has taken place in the Tyne at present as compared with the year 1832?—Yes.

4586. Will you point out in what particular parts of the Tyne it has taken place? In the first place, did the Tyne main shoal exist at the time of your first knowledge of the river?—I cannot go into details. I am not sufficiently acquainted with the river to answer such questions. I did not come here prepared with any evidence upon the subject of the river Tyne.

4587. You only state generally your opinion; will you state upon what grounds that opinion is formed? Have you been frequently going up and down the Tyne yourself?—I have, and it is upon that general knowledge, without an examination of charts or of soundings that have been taken recently or at a prior date.

4588. Your opinion, formed on general grounds, and from your own knowledge, is, that the river has improved as a navigable river?—Yes.

4589. Are you acquainted at all with the different plans which have been in contemplation for the building of piers at the entrance to the river?—I have seen Mr. Walker's, Mr. Brooks', and Mr. Rendel's; those are the only plans which I have seen.

4590. From your own knowledge, as a professional man, will you state your opinion upon those piers?—Being very much interested in the subject of the improvement of the Tyne as well as of other rivers along the coast, I naturally, when resident at Sunderland, and since, have taken an opportunity on various occasions to inspect the mouth of the Tyne. I have been professionally employed in many of the harbours along that coast. The mouth of the Tyne is one of those which I have often studied, the effects of the tides upon it, and the means of improving its entrance by the erection of piers.

4591. Have you ever been led to make any sketches or plans of the piers which you would there propose?—Simply as an amateur, and for my own information as an engineer. I have not been asked for plans, nor have I made them public.

4592. Have you any objection to give the Commissioners your opinion of Mr. Walker's piers?—I have sketched out on an Admiralty plan what are my own views upon the subject (*producing the same*). The yellow is what I understand to be either Mr. Walker's or Mr. Brooks' plan, and the red are the piers projected by Mr. Rendel. I have often considered the subject before these plans were promulgated. My own views were, confining the mouth by piers, the southern one running in a circular direction across the Herd Sand, and the northern one south of the Spanish Battery, so as to cover the Black Middens and the rocks so dangerous to shipping. I think that it would be preferable to have a large part of the northern pier open for the purpose of allowing the flood tide to pass easily up the river. By the flood tide striking a solid southern pier, the waves might be diverted into a large beaching basin on the south side, but the momentum which would be given to the water in striking a solid pier would still throw it up the river. The ebbing current might be confined at the Low Lights, so as to make it act with some force upon what is called the 9-feet bar, and carry forward the impetus of the water to act upon the bar beyond the pier heads. My great object in piers, from what I have seen and studied, particularly at Sunderland, is to conduct the large body of water as much as possible against a solid pier, and thus to force it up the river, depending more upon the momentum than upon statical pressure. These lines are a contour of the bottom, at certain distances below low water, showing the direction of the tide; and as it comes over the shoals it causes deep water, and it goes in that direction (*showing the same*).

4593. Are you aware that one of the objects of Mr. Walker's intended piers was, to procure a greater amount of shelter within them, so that when ships passed in or were going out they would be in, comparatively speaking, smooth water, which your piers, as I

J. Murray, Esq.

16th Feb. 1855.

look at them now, do not appear to me to afford?—I have not thought it necessary to prolong the piers to the extent proposed by Mr. Walker; if so they would give a long run into the harbour, and I think that longer run into the harbour would be beneficial, and throw the bar further out into deep water; but it would be attended with a large cost.

4594. Your piers would be, I suppose, very much cheaper than those proposed by Mr. Walker?—I presume so; seeing that they do not go into the deep water, like those projected by Mr. Walker.

4595. (*Mr. Brunel.*) You have been acquainted with Sunderland for a good many years?—Since the year 1832.

4596. The piers have been extended, I think, outwards since then, have they not?—The northern pier was extended by me for a considerable distance beyond the old pier; the old pier was rooted out and a portion of it to the westward was refaced.

4597. Formerly the old pier did not extend so far as the south pier?—No; I think you are right. I have plans of Sunderland harbour, which probably the Commissioners would like to look at, inasmuch as they give a very curious history of what has been effected in that harbour from the period when it had no piers at all until the present time. (*The Witness produced the same.*) The series of plans which I now produce to the Commissioners accompanied a paper which I gave to the institution of Civil Engineers some years ago, and printed in their minutes. They are copies of the plans deposited with that paper. The first of them, in 1719, is a plan of the mouth of Sunderland harbour previously to any piers being constructed, showing a wide estuary with the ebbing waters meandering among sandbanks until it reaches the deep water; the navigable channel passed over an inner bar called the Stell, and progressing to the eastward, passed over the outer bar. No. 2 is a plan of the mouth of the river Wear, between 1737 and 1757, when the south pier had been projected to a certain distance, pointing in a north-easterly direction. Mr. Labelye, the engineer of Westminster Bridge, was consulted by the Commissioners of the river, and he recommended a north pier to be erected for the purpose of sheltering the harbour, and a very voluminous report was made by him upon the subject. The purport of it in connection with the mouth of the river is, the building of a north pier, shutting up the old channel called the Stell, proposing a line of wharfage to join the pier with the ballast hills in the interior of the harbour, and opening out a south channel, so as to strike the extremity of the south pier. The north pier was not executed, as he, in his own report, threw some doubts upon it, and whether it would not have to be taken up again if it did not answer the purpose.

4598. (*Captain Fitzroy.*) And that was some time after the south pier had been executed?—Yes; the south pier had been executed alone. In the year 1737 there was a survey made under the authority of the commissioners of the river to the extent of the tidal flow, and upon that survey there are certain soundings given, which I have laid down on a longitudinal section of the river; I shall produce it presently, for the purposes of comparison with what it was in the year 1842. No. 3 is a plan of the mouth of the river in the years 1779 and 1780, when Mr. Smeaton, the celebrated engineer, was called in by the Commissioners to give his opinion upon the extension of the south pier. The resident engineer of the Commissioners, Mr. Shout, had projected a continuation of the south pier in an easterly direction. A part of the pier having become dilapidated, it was necessary to be taken down, and his opinion was, that it should have that direction. Mr. Smeaton approved generally of the plan; but thought that the extremity of the pier should be pointed in a northerly direction. At this time a vast quantity of sand had become lodged on the north side of the river, caused by the water striking the pier, but the river itself was prevented from being silted up in consequence of the ebbing waters. A large accumulation of sand took place upon the Ham Sand in the winter of 1783, and it was afterwards enclosed. In the year 1780, Mr. Robson, the resident engineer of the Commissioners, projected piers on the north and south rocks, leaving a very large space within the pier heads. Some portion of the south pier was executed, but the scheme was never carried out. In the year 1785, the entrance of the harbour was choked by the accumulations of sand which had taken place on the northern side; the gales brought in the sand, and absolutely choked the mouth of the harbour. Steps were thereupon taken to get rid of this immense accumulation of sand. No. 4, is a plan of the mouth of the river Wear, showing the commencement of the north pier in 1786, and its termination in 1797, with the extension of the south pier. The scheme recommended by the engineer of the Commissioners was to run out a south side jetty and another on the north side, for the purpose of scouring the river between the extremity of the latter jetty and the south pier, and it had the desired effect of opening out the channel, and that gave rise to the building of the north pier. This pier was commenced by a series of timber carcases, built elsewhere, floated down, sunk with stones, and carried out in an easterly direction from the land seaward to an extent of 1,500 feet. The consequence of the erection of these timber carcases, was an accumulation of sand on their northern side, which filled up the whole receptacle between them and the high land of the coast. The extremity of the timber carcases being ruined by ships coming in contact with them, and exposure to the sea, gave rise to the building of the stone pier from a certain point of the timber carcases eastward; that pier was afterwards prolonged to 700 feet, and

J. Murray, Esq.
16th Feb. 1855.

ultimately 115 feet more. The south pier was also prolonged 327 feet, in the manner shown on the plan. It will be observed that a large bed of sand still hugged the south pier, and even extended beyond it. The next plan, No. 5, shows the state of the piers between 1804 and 1807, with their proposed extension by William Jessop, an eminent engineer, and his proposition was to confine the mouth to 250 feet in width. He recommended that a part of the south pier should be taken up, and that the direction should be given to it as shown by dotted lines. He also proposed the formation of a basin on what was called the Potato Garth, which is a shoal or beaching ground on the northern side of the river. Plan No. 6 shows the state of the piers in 1819, when the late Mr. Rennie was called in by the Commissioners to give his opinion upon what should be done with regard to the mouth of the river. Mr. Rennie's lines are denoted in red ink upon this plan.

4599. (*Chairman.*) Were they executed?—A portion of the south pier has been executed as far as the extremity of the old pier; the north pier has been executed, not exactly on those lines, but something very similar to them, without the projecting spurs. The plan No. 7 shows the state of the mouth as it was in the year 1846. My predecessor had executed the south pier; I did the north pier, and cut off some portion of the angle of the pier. At an after period I threw back the south pier into the form of a beaching basin, something similar to the Potato Garth on the opposite side, for the purpose of preventing the in-run of the sea.

4600. (*Captain Fitzroy.*) Has it had that effect?—It has had the desired effect, as tested in the following manner in the year 1846:—The height of the wave was observed at the extremity of the north pier to be 7 feet in height between the hollow and the crest, and noticed to run along the north and also along the south piers, and at the western end of the latter pier, where it entered the beaching basin, it was diminished to 3 feet 7 inches in height. As the western side of the beaching basin was naturally formed into a large bed of sand, the wave was dispersed upon it. The wave that rolled up the deep water opposite to the Commissioners' yard was then ascertained to be still further diminished; being from 9 to 11 inches in height. The waves previously to this beaching basin having been formed, were so violent that sometimes no vessels could lie alongside the staiths where the coals are shipped. The complaint was so general and serious that every means was adopted for the purpose of preventing that inrun of sea. On the northern side the wave which rolled along the north pier struck what is called the "Jetty Pier," and I opened that for the purpose of allowing the sea to pass through it, but a portion of solid work still remained, which I was of opinion should be removed also, in order that all should be open work. I often observed the great advantages of the water being thrown through this pier; it had this effect, that the wave which passed through it was retarded in its passage, while the one which hugged the pier threw itself round on to the Potato Garth. This last meeting with the wave which had passed through the pier, the two came in contact, and were dispersed upon a certain part of the Potato Garth; and there was always a mass of shingle thrown up there in consequence of the meeting of those two seas. The wave, after that, had to roll round the Potato Garth, and so pass up the harbour, but it was then materially lessened in height. Since I left the Commissioners of the river, other works have been carried out. The whole of this pier has been removed, a jetty has been thrown across the Potato Garth, the northern tail of the Potato Garth has been deepened by dredging; and the consequence is, that it is now very much exposed to easterly gales, while the waves rebound from it and run up the harbour, as well as pass across the river into the entrance of the South docks. The ebbing waters, in consequence of the excavation along the tail of the Potato Garth, strike the north pier at a more westerly point than before, and the impinging angle is such as to throw the ebbing current in a south-easterly direction, leaving a spit of sand at the extremity of the north pier. While I was executing the works at the north pier, a spit of sand did form there, and my attention having been drawn to it, I attempted to disperse it. The remedy that I adopted was, to root out a portion of the south pier, to dredge the southern shore as much as possible, and to remove a large mass of shingle westward of the Commissioners' yard. The consequence was, that I threw the ebbing current more to the eastward, and completely dispersed the sand-bank at the extremity of the pier. For four years, between the year 1845 and the year 1849, we had a tolerably deep bar, with about four feet of water over it. The in-set of the flood into the harbour is shown upon this chart (*producing the same*) or map of the river Wear, made by Mr. Giles under the directions of the late Mr. Rennie in the year 1819, and some years subsequently. It is thereon delineated, and I am aware that such did exist when I became acquainted with the harbour, of the flood tide setting from the southward round the south pier, and so into the harbour. The main set of the flood tide is from the northward, and the deep-water flood running with greater rapidity than it does inshore, the tendency is, by projecting the north pier so far to sea, to drive out a portion of that flood tide to the south before it can pass into the harbour. In the year 1832, there was a long spit of sand thrown out in a north-east direction, and in immediate connexion with the south pier. It was cut by the early flood tide coming round it, but the main ebbing waters were thrown upon the north pier, and endangered the foundations. I took immediate steps to reduce the height of this shoal, and to admit the early flood as much as possible into the harbour. For the sake of comparison, I have brought a plan of the river, made in the year 1737, on which the heights of spring and

J. Murray, Esq.

16th Feb. 1855.

neap tides are marked at different places within the tidal flow; and I have delineated the said tides on a longitudinal section from the bar upwards. The bed of the river is delineated in black as its state in 1842, and the brown is what it was in the year 1737, as taken from the soundings delineated on the chart. The low-water and the high-water of ordinary spring-tides, or datum, are delineated in blue, and the brown is the state of the water obtained from the statements of the chart. I assume the low water at sea, or beyond the bar, to have been the same then as it is at the present time, but the flow of tide marked upon this chart is 16 feet 6 inches; the ordinary rise of a spring tide is considered 14 feet 6. The rise of an equinoctial spring tide is 3 feet 9 above the datum. Now, you will observe the state of the river in 1737 compared with what it is at the present day. You will see that the bed of the river was very much higher than it is at present; it is scoured down in consequence of the works which have been executed by the Commissioners. The low-water at Biddick of spring tides in the year 1737 is higher than the high-water mark of spring tides at the present day; but the bed of the river has been scoured down nearly to the same extent, and therefore nearly the same quantity of tidal water is admitted at the present day as was then. But, of course, the drainage of the country is very much improved, and the level of the water is lowered all throughout its course from Newbridge, which was the extent in that day of the tidal flow. The navigation was then carried up a short way below it, whereas now no navigation passes higher than Biddick Ford, two and a half miles below it, and thus the tidal flow is reduced two and a half miles. You will see that the whole bed of the river downwards has been scoured deeper than before.

4601. (*Mr. Brunel.*) To what works of the Commissioners do you ascribe that scouring?—The works of the Commissioners have been dredging the river, running out the piers, confining the current at its mouth, taking off a great number of bends, and rooting up rocks in the bed of the river.

4602. High up the river?—No; the whole of the works are in the lower part of the river; I may draw your attention to the fact, that in 1737, with only one pier, the water striking the south pier was thrown up further into the country to a level higher by 5 feet 3 inches than it is at the present day. In the year 1737 there was only one pier, and that happens to be the very year in which this chart was made by Burleigh and Thompson, and which I have delineated on the longitudinal section now before the Commissioners. That shows the tide, deducting the two feet for the rise of tide above the datum level of the present day, attained a higher level by 5 feet 3 inches than it does at the present time.

4603. (*Chairman.*) And the bed of the river is so much deeper?—And the bed of the river is so much deeper; I assign the reason in my paper that the water having struck the pier had a momentum given to it, which carried it further up the country than at the present day.

4604. (*Mr. Brunel.*) Upon that point there is a great diversity of opinion, and, as a great deal hangs upon it, I should like to have it proved very clearly before us; where do you see proof of it, and have you any other evidence of it besides mere reference to this chart and this section?—I have this: that in the year 1832 the north pier from the lighthouse eastward was an open timber framing, solid to a certain height. The extremity of the south pier was then a solid pier. A few years previously to that, in the year 1819, Mr. Giles had taken very accurate observations of the height of the tides all the way up the river, and his observations led him to the conclusion, that the high-water mark of ordinary spring tides attained a level throughout the river as far as it flowed.

4605. Not more?—Not more. His observations proved that it was nearly a level line between the bar and Biddick, nine miles from its mouth. In making other observations of my own, in the year 1842, I had reference to the same gauges which Mr. Giles had placed in the river, and by observing a great number of tides I found that it had attained somewhat about eight inches higher than the level line in the year 1819. Since 1842 the present engineer of the Commissioners has told me that it was something about the same.

4606. Has anything resulted from the alteration since 1842, because since 1832 the north pier was no longer open?—I imagine that the momentum given to the water is chiefly in consequence of the improvements which have been effected by the River Commissioners in dredging the interior of the harbour, removing a great number of shoals which had existed, and increasing the sectional area to allow a free passage for the water up the stream.

4607. I understood you to state that the solid form of the south pier beyond the north pier, and the north pier being hollow, caused the tidal wave to strike the south pier and to run up rapidly, and you were about to prove that by the evidence, that in 1819 it ran up to a certain height, and that in 1842 it ran up to a greater height?—Yes, but it proceeds from the internal improvements of the river rather than from the altered form of the piers.

4608. I supposed that during those periods the south pier had been run out?—The south pier had been built solid.

4609. But since 1832, if I recollect rightly, the north pier had been made solid?—Yes.

4610. And it would project beyond the south pier?—Yes, but only to a small extent.

4611. Has a reaction taken place?—I am not aware of it.

4612. During the time between 1819 and 1842 you say a great deal of other work was done in the shape of dredging ?—Yes.

4613. When you said just now that the low water at a certain place in 1737 was higher than the high water is now, I suppose that at that time the tide did not reach that place at all ?—The tide went to Newbridge, which is $2\frac{1}{2}$ miles above it.

4614. Have you anything which will show us the tidal wave at that time. The tide then ran up much higher than it does now I suppose ?—It did.

4615. At that time what was the state of the piers ?—There was only the south pier existing ; no north pier whatever.

4616. At Biddick Ford is there any record of the tide in 1737, and did it rise there much higher than it does now. From the sections did the tide rise higher at Biddick Ford with reference to the ground than it does now ?—Yes.

4617. How much ?—4 feet 3.

4618. At that time the mouth of the river was somewhat of a trumpet shape, and pointed northwards ?—It was, and of course the river was very much obstructed from the shoal ground which existed in the bed of the river.

4619. That would impede its running up ?—Yes.

4620. By this chart it would appear that the relative position of the lateral shore and of the pier formed a trumpet-shaped mouth which would receive the tidal current ?—Yes.

4621. And from that time from these documents which you have looked into you state it as your conviction that the tide rose 4 feet 3 higher than it does now at Biddick Ford ?—Yes, that is my firm conviction. I will follow this up, if you will permit me, with some other facts. I am of opinion that the projecting headlands along the coast have a very great effect in keeping up the tidal waters. I had occasion to contour the whole area of the North Sea for the purpose of a paper which I communicated to the Royal Society, and I have borrowed that plan from the Society, which indicates the shoals of the North Sea, and gives a series of co-tidal lines deduced from those shoals. I also had sets of observations, made while in Sunderland in the year 1838, of the height of the tide in Shields harbour, at Sunderland, and at Hartlepool ; I have brought those observations with me. They were taken in the month of January and the beginning of February 1838, and in July 1838. The result was that I found the tide rose higher at Hartlepool, about a foot or eighteen inches, than at Sunderland. I imagine that was caused by the projecting headland of the Yorkshire coast.

4622. Will you apply the result of your investigation upon that point to this particular case ?—I think that the projecting coast raises the tidal water higher at Hartlepool than it is at Sunderland.

4623. As applied to the mouth of the Tyne, what conclusion do you draw ?—I am alluding to the projecting headland along the coast having the effect of raising the tidal water, and I bring it in corroboration of the statement to which I have alluded as to the tidal column.

4624. As regards the course of events, with the alterations which have taken place in the Sunderland piers, have you any facts to adduce to show what the effects have been, because the alterations of the Sunderland pier have been exactly analogous to this case. You have known the harbour of Sunderland from 1832 ?—Yes.

4625. Since that time, and up to the present there have been considerable changes in the relative position of these piers ?—Yes.

4626. In 1832 the south pier projected as a solid pier, if I recollect rightly, while the north pier was very open ?—A portion of it was open.

4627. And the set of the tide and the set of the swell did come through the north pier ?—It did.

4628. Were there any effects produced there which appear to you to have ceased since you made the north pier solid ?—When I made the north pier solid I thought the bar was more stationary and deep, but not entirely from the solidity of the north pier, but more from the improvements.

4629. Then it does not occur to you to point out any particular result which is apparent from substituting a solid north pier for an open one ?—No ; I think it would be inappreciable in transferring the open piers of the north pier to a solid state that nothing could be deduced from it.

4630. Since then the north pier has been carried out a good deal further, has it not ?—It has.

4631. And it at one time projected a good deal beyond the south pier ?—Yes, it projects now.

4632. Have you observed any effect produced by that ?—No ; but it is not projecting to a very great extent. It was solid to a certain height, and open above. I believe this plan has the sections of 1819 and 1832 put side by side.

4633. Then, judging from the effects which in the last 25 years have shown themselves at Sunderland, there would not seem to be any objection to the two piers being carried out to the same distance, or even the north one a little further than the south ?—I think it would be more a matter of nautical propriety than of engineering.

4634. As far as the scour of the river is concerned, and as far as the bar is concerned, judging from Sunderland, do you see any reason why at Tynemouth the piers should not be carried out each to about the same distance north and south ?—No.

J. Murray, Esq.

16th Feb. 1855.

4635. With respect to obtaining the set of the tidal current against the southern pier, and sending it up the river in the manner which you thought so beneficial on the Wear, you do not think it would be worth carrying out the southern pier a great deal further than the northern ?—Not to any great extent.

4636. As regards the curious fact which you have mentioned with respect to the rise of the tide up the river in former years, is there no record of what the bottom of the river was at that time ?—Only between Newbridge and Biddick Ford and between Hylton Ferry and the Bar.

4637. Not at this important part ?—There is a gap between Hilton Ferry and Biddick Ford which has no soundings, for what reason I cannot tell; but those I have connected together by levelling.

4638. What was the depth of water in 1737 at Biddick Ford, at the same high water as the one we are considering at present ?—It was then 7 feet.

4639. And what is now ?—5 Feet.

4640. Is there any other fact which you can mention which would corroborate the fact that the tides formerly rose very much higher at Biddick Ford than they do now ?—I think the most important evidence is the documentary.

4641. Do you know of anything which could corroborate that evidence—any trace upon the ground ?—It is well known that keels used to take in their cargoes of coals at Pictory, 2½ miles above the present tidal flow, and navigate the river from thence downwards. No navigation can now be carried above Biddick Ford.

4642. (*Captain Fitzroy.*) Upon what foundation do the soundings taken in 1737 rest ? what authority is there for believing that the section of the river at that date is so correct, as to admit of an exact comparison with the section of the river in modern times ?—I grant that you may not be able to compare them with regard to any particular spot, but those soundings extend over a length of river 2½ miles in extent; combining the whole soundings and laying them down on paper will give the general variation. I think it would be erroneous to judge from any identical spot; but taking it over an extent of some 2½ miles there could be nothing very erroneous in the deductions formed from such a basis.

4643. (*Mr. Brunel.*) As to the level of the water at high water at Biddick Ford, that is from some positive level, is it not ? What is the record of the state of things in 1737 ? how do you get the level of high water at Biddick Ford in 1737 ?—From the table given on the plan. Of course it greatly depends upon the accuracy of this statement.

4644. At Biddick Ford there is a rise and fall of 5 feet ?—Yes.

4645. How have you got from that the level of high water ? Is that the only information from which you have made this section ?—From the whole combined.

4646. There was a rise and fall on that day of 16 feet 6 at the bar, and there was a rise and fall of 5 feet at Biddick Ford; how do you get the high water from that ?—There are some other figures; the two are combined; there are levels besides in another table at different places all the way up the river.

4647. At Sunderland what do you find in practice to be the result when vessels are entering between two parallel piers; are they not liable to be thrown upon the south pier ?—The chief navigation of Sunderland is done by steam tugs, which take the vessels in and out of the harbour. In bad weather it depends upon the wind; if there be a strong northerly gale, they keep close to the north pier, and get immediately under its lee.

4648. Is it or is it not the fact, in practice at Sunderland, that vessels running in in north-easterly gales have not only great difficulty in making the mouth at all, frequently going ashore to the south; but when they do make the mouth they find great difficulty in avoiding being thrown upon the south pier ?—If the tide has a very strong set at that period of the tide when they enter, they sometimes are thrown too far to the south, and are thrown outside the pier.

4649. And inside, too, are not they ?—And sometimes close inside.

4650. And against the pier ?—Rarely against the pier; there are instances where they have struck against the pier.

4651. Do you think, from your experience at Sunderland, having seen a great deal of the practical operation of the works there, that the south pier being made parallel to the north pier is no inconvenience to ships entering under stress of weather ?—I think not; in fact the parallelism of these piers rather renders a facility in entering that harbour than otherwise; the current carries them forward; it is between half flood and high water; vessels enter the Sunderland harbour generally light in ballast between half flood and high water.

4652. You have had a good deal of experience there, and you think that the parallel south pier is not a material inconvenience ?—I would rather they should have been both parallel than the sort of trumpet-mouth which is given to the pier. At the southern outlet of the Sunderland Docks, which I am now constructing, the piers are thrown back in a totally different direction, but that is for the dispersion of the waves in such an exposed outlet.

4653. With respect to parallel piers, you stated that you had found a very extraordinary advantage in the diminution and almost destruction of waves by a sudden enlargement just within the north and south pier ?—Yes.

4654. The same effect, I suppose, would be produced by the arrangement of piers as

proposed by Mr. Walker at the Tyne?—I think not; there is no parallelism in the piers as designed by Mr. Walker, and there is no bulging out on each side, as at Sunderland.

4655. Merely with respect to the destruction of the wave, do you see any advantage in first confining the wave within parallel lines, so as to concentrate its force and shape it into a well-formed wave, and then letting it expand?—No, I think not. For the purpose of dispersing the waves, I would open those piers as I am now doing at the southern outlet.

4656. As regards the form of the piers as proposed by Mr. Walker, at Tynemouth, that effect of the dispersion of the wave would be produced?—The dispersion would be produced.

4657. In the most effective manner?—In an effective manner, but you get rid of the advantages of the parallelism.

5658. But as far as the wave is concerned, parallelism cannot be of any advantage?—No.

4659. In fact, a cone with the small mouth towards the sea would be the right thing for the destruction of the waves?—Yes; but I see considerable advantage in throwing the pier backwards in a curved form, both north and south, for the purpose of getting rid of that wave which had been generated between the parallelism of the piers. I have observed that the wave strikes this south pier, it rolls up along it, completely hugs it, and turns itself into this beaching basin, while the wave of the deeper water is carried forward; and so much do I believe that to be the case, that if this pier had been made circular altogether, I could have forced that entering wave to have met the outward wave, and have formed a sandbank between them.

4660. Do you mean that you assume that the wave will turn a round corner a bit easier than it does a sharp corner?—It traverses round a curve.

4661. Does it traverse round a curved channel more easily than it does round a square cornered one?—Yes. (*The Witness produced a Plan.*) Here is the sea outlet of the Sunderland Docks now in course of construction, where the north pier is solid with a curved head, level with high water for the purpose of allowing heavy waves to fall over it and kill the entering wave thrown in by a south-easterly gale, which has a tendency to hug the pier.

4662. Is this constructed?—It is now constructed as far as the head. The southern break-water pier is done with timber, solid to a certain height; the waves penetrate through it, but it is designed to be an isolated pier, so that the wave which penetrates on the left hand will have a tendency to hug this pier and be thrown against the external wave, and meeting it, will form a sandbank between the pier and the embankment, making a large expanding tidal harbour for the waves to fall into.

4663. You have had a good deal of experience at Sunderland in dredging?—I have.

4664. About what quantity do you dredge in the year?—Somewhere between 100,000 and 150,000 tons.

4665. That is dredged and sent to sea?—It is; it is done by steam dredgers, put into hopper vessels, and the hopper vessels are towed out to sea by steamers.

4666. Is any portion of it put ashore?—Little or none.

4667. What does it cost you in round numbers?—Extending over a period between 1842 and 1846 the total average cost per ton on the year's expenditure was as near as possible 4*d*. I have subdivided that into four heads: for raising and depositing at sea the expense was 1½*d*., the fuel was a little better than one-tenth of a penny, the labour in repairs was about a penny, and the materials for those repairs were about 1¼*d*.; that was the result of five years' work, and the total quantity raised in those years varied between 90,000 and 141,000 tons.

4668. As a practical man, is there anything in these accounts which requires explanation, or may we assume that is somewhere about the real cost of the thing?—I am perfectly sure that is the real cost, because the whole of the accounts passed through my hands; I had them analysed, and I can state they are correct.

4669. I suppose there is no interest on capital there?—There is not; two machines are employed in dredging, one of them has two ladders, and each is worked by a steam engine of 12-horse power; the other has one ladder, worked by a steam engine of 14-horse power. Then there are a number of hoppers, I think at that time there were eight hoppers engaged, and a steam-tug. The capital embarked in that I have valued at 12,000*l*. I believe the Commissioners have engaged a larger number of hoppers and a greater number of dredging machines than when I was there. I am speaking of the capital engaged at that time.

4670. 15 per cent upon that would be how much?—1,800*l*.

4671. That would be about another 2½*d*.?—Yes; it would make it 6*d*., or a little better per ton.

4672. So that from your experience there, a contractor could find plant and do everything for somewhere about 6*d* a ton, but without any large profits?—There are no profits in that.

4673. He could do it?—He might do it; there would be no difficulty in doing it. I believe they take the ballast a little further out to sea than was done at that time. This was deposited in 5 fathoms water at low water. I think they are now obliged to take it out to one or two fathoms more, some distance further; but that amounts to very little.

J. Murray, Esq.

16th Feb. 1855.

4674. Would the price be materially affected by your dredging a mile or two up the river?—Of course there would be longer time in taking the vessels backwards and forwards.

4675. What would be about the effect, considering that it is tide work?—It would be very trifling.

4676. If the vessel could go to sea the same tide, would it make any difference?—Not any.

4677. Do you know any reason why those prices could or could not be taken as estimates of what the work might cost on the Tyne?—The distance is much greater in the Tyne, decidedly.

4678. Do you think they could not go to sea in one tide?—I am afraid they could not go to sea and back again to the higher part of the river in one tide.

4679. We will say from Hebburn quays downwards?—I do not think they could accomplish it in one tide. At Sunderland the whole dredging operations are confined to about a mile or a mile and a half above the pier heads, little or no dredging is done above that; there is therefore every facility for their going out early on the flood tide, and returning again before the ebb; but if you made the distance from where the dredging machines were at work to the place of deposit, very great, of course they could not accomplish it in one tide, and there would be the detention of the vessels during another tide, it would therefore require probably more hopper vessels to keep the work going.

4680. What do you estimate would be the difference? if you will look to your details you will see which item it would affect?—It would affect the expense of taking to sea and depositing at sea. I believe the depositing at sea is a very small portion of the expense.

4681. It would not affect that?—Very trifling; it would require more hopper vessels, which would be the principal thing.

4682. Then, except the capital invested in the keels or hoppers, would the distance to sea have any very appreciable effect on the total cost?—It would not, excepting in the detention——

4683. Which amounts to little?—And obtaining others to make up for the time lost.

4684. There would be an increased number of hopper vessels, and therefore an increased amount of capital in hoppers, but no more dredging machines?—Just so.

4685. As regards taking ballast to sea from vessels in Shields harbour and the lower part of the river, I suppose it could be carried to sea at the same cost as in the Wear? Could not ballast from ships be put into hopper vessels?—It could.

4686. And taken to sea at as low a rate as the dredged ballast is taken to sea?—Yes. At Sunderland a considerable quantity of ballast is taken out by private individuals in hopper vessels. The Sunderland Dock Company do so likewise to some extent.

4687. And taken to sea?—And taken to sea.

4688. And if it could be taken out of the vessels and sent to sea would it be a much higher cost than the dredging and sending to sea?—No.

4689. Even if it included the getting it out of the vessel? I mean the lifting?—There is the getting it out of the vessel.

4690. It has been suggested to me that I should ask during how many months in the year dredging is carried on at Sunderland?—From eight to nine months.

4691. What do they do the rest of the year?—The hoppers are laid up, and during that interval the dredging machines are repaired; any substantial repairs which are required are done at that time.

4692. I suppose it would be done more cheaply if you kept on the whole year?—It would.

4693. (*Captain Fitzroy.*) Upon this plan, on which so much depends, I read "datum "horizontal line, high water of ordinary spring tides," that horizontal line goes throughout the plan; that is one datum line. Below I read "horizontal line, low water of ordi- "nary spring tides on the bar," that is another datum line. I ask you whether any horizontal line has been ascertained along the banks of that river by bonâ fide levelling, irrespective of tide at all?—It is all taken by levelling. Mr. Giles' surveys were made entirely by levelling, and with no reference whatever to the flow of the tide. Mr. Giles, by taking levels, started with a fixed tide and put up gauges along the river in various places up to Biddick Ford, by levelling.

4694. The method which he adopted for levelling was by measuring the tides?—No; by spirit level, by instrument.

4695. If I am entirely wrong in my view, it is a very remarkable fact that one datum horizontal line being high water of ordinary spring tides, and the other datum horizontal line being low water of ordinary spring tides, they should each coincide exactly throughout the whole length of the river with the bonâ fide level line obtained by mathematical calculation referred to the figure of the earth only, and in no degree to the moveable water. As I read the words in plain English here, the datum horizontal line, which extends throughout the whole length of the river for nine miles and upwards, coincides exactly with the high water of ordinary spring tides?—I believe that is Mr. Giles' deduction.

4696. It is a very remarkable fact, and perhaps occurs in no other place in the world. In the Tyne it is very nearly so, but here it is very remarkable that the successive line of high water spring tides does agree throughout with the actual horizontal line; and here again I find "horizontal line, low water of ordinary spring tides on the bar,"

J. Murray, Esq.

16th Feb. 1855.

which extends also throughout the whole length of the river. Now that the low-water level and the high-water level should each coincide throughout the whole length of a river with a mathematical horizontal line, irrespective of water at all, is very remarkable, and therefore I think that this plan is not founded on a true basis. I hope I am quite wrong, but that is my opinion?—I may have misunderstood you; the second horizontal line is simply a line drawn 14 feet 6 below the other datum horizontal line, which is high water of ordinary spring tides, 14 feet 6 on the tide gauge of the north pier. Mr. Giles, by these gauges, which he had erected in various places up the river, ascertained that in an ordinary spring tide it attained a level line from the bar to the extremity of its flow, these gauges having been accurately placed by means of levelling throughout; and Mr. Rennie quotes that as the datum in the whole of his calculations on the quantity of tidal water admitted into the river on that basis. The low-water line at neaps and springs is laid down on the section, and they are not by any means a horizontal line.

4697. "Low water of ordinary spring tides on the bar"?—But it is low water there; that is not a horizontal line all the way up the river.

4698. He refers all his measurements here to the horizon of the bar?—Yes.

4699. If, instead of referring to that starting point, your starting point varies 5 feet one way or the other, then that horizontal line must be carried up or down 5 feet for any modern measurement. You cannot compare the measurement in 1854 with a bar, say 5 feet higher or lower than the bar at that time, without also changing your level the whole way up the river?—I think the misunderstanding is assuming the words "the bar" for the datum at which you start; it is not the bar itself, it is the water at the bar.

(*Captain Fitzroy.*) I am aware that I am going in direct opposition to the eminent engineer opposite; but I see plain English clearly written, and I cannot myself understand those words in the sense which he attributes to them.

(*Mr. Brunel.*) Because they are mere conventional words, and that is the meaning applied to them, and with which this man wrote them.

4700. (*Captain Fitzroy.*) I am of opinion that the physical bar itself on that day was assumed as the starting point for those purposes. That is a century ago, and if you in the present century start from a point 5 feet vertically above that old point from the change in the bar, you must alter your datum line of low water horizontally throughout the river in proportion.—Granted, if it were so, but I, as an engineer studying this, think that the basis with which you start would be totally at variance with the plan. You will observe that the table says the flowing of the tide compared with the bar at the bar, then this other part says that it is a level line, taken out as the horizon of the bar, namely, low water of spring tides of that day.

4701. And those measurements are laid down in this modern section, and are taken as the starting point with which to compare the modern section, making no allowance for the change in the position of the bar?—It is not from the bar.

4702. (*Mr. Webster.*) You have said, in answer to Mr. Brunel, that for the purpose of dispersing the waves, piers, such as those proposed by Mr. Walker, or a cone with a narrow orifice and a large base, would be the best?—Yes.

4703. But I understand you to say that, for the purpose of conducting in the water so as to preserve the momentum, you must have piers more or less parallel?—I think so.

4704. You referred to the case of the Yorkshire headland as, in your opinion, leading to an elevation of the water at Hartlepool?—It is my opinion.

4705. What is the position of the Yorkshire headland with reference to the entrance to Hartlepool and the direction of the flood-tide?—The projecting headland of Yorkshire is nearly at right angles to the direction of the flood.

4706. That is to say, it is south of Hartlepool?—Yes, several miles.

4707. Then, in your opinion, does that projecting headland, by reason of the change of form which it gives to the flood wave, occasion it to pass into Hartlepool?—It occasions a recoil and a heaping up of the waters.

4708. The momentum of the flood tide is diverted by reason of the Yorkshire headland into the harbour?—Yes; it is a recoil or heaping up caused by the projecting headland.

4709. Let me compare this for a moment with the state of things at Tynemouth. At Tynemouth, is the projecting headland to the north of the entrance?—It is.

4710. Then, so far as regards Hartlepool and the Tyne, the headlands are exactly on the opposite side?—They are.

4711. Then, in your opinion, does the headland at Tynemouth act exactly in the same or in a different manner to the Yorkshire headland?—I have no doubt of this. If the headland at the mouth of the Tyne were removed and there were projecting land on the southern side of the harbour, the tide would be heaped up into the Tyne more than at present.

4712. Would not that state of things which you have now pointed out at the mouth of the Tyne, namely, the removal of the headland on the north, and the consequent projecting of the tide into the harbour, be, to a certain extent, obtained by a south pier projecting out?—It would.

4713. You told Mr. Brunel that you regarded the entrance of the water into an estuary like the Tyne as more a question of momentum than of statical pressure?—I did. I think so.

4714. If it be a question of momentum, and not of statical pressure, is the extent of the trumpet mouth, so to speak, and the position of the pier which shall catch the flood tide, of essential importance?—Very great importance.

J. Murray, Esq.

16th Feb. 1855.

4715. Just look at the sketches on this diagram. I will suppose this to be a line parallel with the direction of the flood tide coming from the north to the south, the centre sketch being somewhat like Mr. Walker's piers, the upper one a north projecting headland, and the lower one a south projecting headland; would the entrance of the water into an estuary situated relatively as this is, as regards the headlands and the piers and the flood tide, be essentially different?—It would be.

4716. And would the quantity of water that would enter upon the flood be in each of those cases essentially different?—It would be different.

4717. You have referred to a plan which you made for piers at the mouth of the Tyne. Your attention, probably, living at Sunderland, would be directed to that question as an engineering question?—Yes.

4718. Am I to understand that in these piers which you have laid down, the black lines show the sort of pier which you would recommend for the Tyne?—Yes; the solid part being black, and the dotted portion being left open.

4719. What would be the position of the existing bar with reference to the piers which you recommend, supposing such to be executed?—The bar would be outside of them.

4720. Then, do you consider that it is an important feature of engineering that whatever piers are put at the mouth of the Tyne, they should be put in such manner as to direct both the flood and the ebb upon the bar?—Yes.

4721. I observe that the outer extremity of your northern pier is left open?—It is.

4722. Would the effect of that be that the flood tide would flow in without comparative obstruction?—It would flow in, but it certainly would be obstructed by the timbers.

4723. As a practical question, having regard to the south and the north piers as you propose, and the north pier being open, would not the south pier lead to a reflection of the tide wave into the Tyne?—It would.

4724. That then to a certain extent would assimilate it to the state of things which exist in nature on the Yorkshire headland, as compared with Hartlepool?—Yes.

4725. I observe that you have placed some piers above the Narrows, near Clifford's Fort, as it is called?—Yes.

4726. Do you consider that for the proper treating of the mouth of this estuary there should be inner piers of that sort?—I think so, because the distance is considerable between the extremity of the piers and the Narrows.

4727. Then am I to understand that the object of these piers which you would be disposed to erect is, firstly to catch the young flood as early as possible coming from the north, and to turn it into the harbour; and secondly, so to direct it by means of inner piers, that that flood tide should go in as true a channel as possible over the bar, both on the flood and on the ebb?—Yes.

4728. I observe that you have laid down here a plan of Mr. Brooks, for piers in 1845. That plan would be quite a different one to the plan of Mr. Walker as now projected?—Yes.

4729. Upon that plan there was a north pier, which, excepting that it extended further out than yours and was solid, would as a guiding wall operate in the same manner?—Yes.

4730. Do you think, having reference to the set of the tide as it is into this trumpet mouth at the Tyne, it would be inexpedient that any north pier should be connected with the mainland solidly?—I think that it would be better to connect it with the land, to have the eastern portion of it of open framing, and have the western portion also of open framing, for the purpose of admitting the tidal waves and dispersing them over the receptacle on the northern side.

4731. You have referred to the expanse of the tidal wave, into what is called the Beaching Basin, at Sunderland, as an instance of the water becoming still?—Yes.

4732. Would the same state of things take place over the Herd Sand, if piers of the kind which you have shewn here were constructed?—I think so.

4733. Were those piers laid down in this manner, and at some sacrifice, the result of your experience at Sunderland to provide for a similar state of things?—Exactly.

4734. Allow me to ask you whether the piers which you recommend here differ in principle essentially from those which I see you have laid down as being Mr. Rendel's piers?—There is very little difference between them.

4735. In principle?—In principle.

4736. I believe the difference, judging from this, would be rather in detail as regards curved surfaces instead of angular ones, which Mr. Rendel has laid down?—Yes, and Mr. Rendel's northern pier is shorter than mine, and isolated; mine is connected with the land, and in part left open externally and internally; the former for the early admission of the flood, the latter for the easy dispersion of the waves.

4737. You have given evidence respecting the effect of the south pier, at Sunderland. I understand you to say that you connect the fact of the water having risen so high at Biddick formerly, with there having then only been a south pier?—Yes.

4738. You think that the south pier placed in that manner at that time, without the north pier having reference to the set of the flood, had an essential effect, and was connected with the rising of the water to that height at Biddick?—I think so.

4739. Is it the fact, then, that since the north pier has been erected at Sunderland, that effect of the momentum of the water has to a certain extent been diminished?—If the plan be correct it is so.

4740. Was the expediency of that north pier influenced or dictated in any manner by the quantity of sand which there was there?—The late Mr. Rennie laid out those piers.

4741. Do you or not know from Mr. Rennie's reports, whether the state of the sand question, or the quantity of sand that was there and which came into the channel, had anything to do with the north pier?—Mr. Rennie does not allude to it, but in his report he states that he alters the direction of the north pier, and places it more northerly, for the purpose of admitting the flood waters more readily than before.

4742. Do you apprehend from the experience which you have had at Sunderland, that if the south pier at Sunderland should be extended further, the tide would rise higher than it does at present?—I believe this, that if the north pier and the north dock were wholly removed, and only the south pier remained, there would be a larger quantity of water passing up the Wear.

4743. I observe that in this paper to which you have referred several times, you state at pages 21 and 22, "The momentum given to the moving column was the cause of the "water rising to 7 feet at Newbridge above the high water at sea. At the same time "the obstacles below impeded the reflux to such an extent, that at Biddick the low water "at Spring tides of that day was nearly on the same level as the high water of spring "tides at the present time. The country has thus been better drained, and as the out-"fall was improved, the waters in the river ran out more freely, increasing the scouring "process on the bed, the whole line of which has been lowered. "These improvements "have caused the high water of spring tides to attain nearly the same level at Biddick as "at sea"?—Yes.

4744. That is the result, is it?—Yes.

4745. You were asked one or two general questions by the learned Chairman about the state of the Tyne, and I think you said that judging from what you saw in going up and down in a steam boat, you think there was less sand in the Tyne than there had been formerly?—I think so.

4746. In your opinion as an engineer, would you consider that the Tyne was in a better condition if the navigable channel should be narrower, although it was deeper? Do you think that the width of the channel is an important thing in a river like the Tyne, having sailing vessels in it?—It is; the depth is of course of great importance.

4747. For instance, in going up with steam tugs only, I suppose depth is an important thing?—Yes.

4748. But if vessels are to turn up, as it is called, or to sail up, is not the width of the navigable channel a very important thing?—It is.

4749. In the opinion which you expressed to the Chairman as to the state of the Tyne, had your attention been called to the state of Shields harbour?—Not particularly. I was speaking in general terms.

4750. (*Mr. Seymour.*) I think you said that the drainage of the Wear has improved in recent years?—The drainage of the country.

4751. In former times there was a greater damming up, I presume, of flood water?—There was.

4752. Would not the incoming flood tide run up higher if the bed was higher? would not the incoming flood tide dam back the waters of the ebb? would not the effect be to raise the bed of the river to a higher level?—I do not understand the question.

4743. (*Mr. Brooks.*) With a shallower navigation or a higher bed, would the incoming flood tide raise the level of the land water or the back water?—The waters would be impounded in the river, they could not run out because of the shallow bed of the river; they are so delineated on the longitudinal section.

4754. (*Mr. Seymour.*) The great majority of the plans which you have produced show the north pier, I think, projecting rather further than the south pier?—Yes; at Sunderland.

4755. On what you call your amateur sketch, connected with the mouth of the Tyne, not that I mean to depreciate it by that remark, but that you were not engaged to make it,) does not the south pier somewhat project beyond the north?—The north is proposed partially as an open pier, and the south pier projects considerably beyond it.

4756. The flood tide, I think you say, would come in through the open part?—Yes, to some extent.

4757. What is to prevent the ebb tide going out in the same way?—Because I do not propose it to be open throughout to the bottom, but solid to a certain height and open above half-tide.

4758. Then what becomes of the ebb tide?—The ebb tide will be guided by the solid part of the pier, and be conveyed out along with the other body of water straight forward; there may be a small lateral influence at the first part of the ebb.

4759. Is it not an important thing to bring the body of ebb and flood to bear upon the bar?—It is.

4760. Will not a considerable body of water get out through these openings in the piers which you propose?—No, I think not; a small lateral motion may be given to the first part of the ebbing waters; but it will not be much, as the strength of the current outwards is between half ebb and low water.

4761. I understand that you have drawn this merely as an engineering question?—I have not been called by any party to give a plan for the piers. I have drawn them for my

J. Murray, Esq.

16th Feb. 1855.

own satisfaction and my own experience derived from an inspection of a great many rivers, and amongst the rest the Tyne, which was in the contiguity of my residence.

4762. In the sketch which you have given, did you take at all into your consideration the effect of the shelter of ships, for instance, in a northerly gale?—I think it will shelter the ships as well.

4763. The crest of the bar, I think, lies a considerable distance beyond the head of your pier?—It must do so; all bars lie beyond the piers.

4764. Considering it not as an engineering question, but regarding it merely as a nautical question, having reference to the shelter of ships making for the harbour in a gale, would not the effect of Mr. Walker's piers be to give greater shelter than yours to ships coming in?—If I am asked my opinion which I would prefer, whether Mr. Walker's piers opening in the direction in which they are shown there, or those which are laid down by me, I prefer my own, both in an engineering and in a nautical point of view.

4765. Inasmuch as your pier is 600 feet inside the bar, of what use would it be with reference to the shelter of ships making for the harbour in a northerly gale?—The chart shows the present bar at the mouth of the Tyne; but the bar will be altered in its position by piers either of a shorter or of a longer kind. The bar as now existing will not be its situation when Mr. Walker's piers are made, and it may be in a totally different position if Mr. Rendel's piers are put there. The nine feet bar, which now exists in the interior portion of the harbour will be dispersed by the building of those piers at the Narrows, for the current would be directed outwards. Naturally a bar will be found at the mouth of a tidal river wherever the ebbing current meets with the body of water in the open sea, and the bar will be found beyond the pier heads.

4766. Where is the bar, or the shoalest water at Sunderland?—Beyond the pier heads.

4767. How much beyond?—It is a shoal situated somewhere about 100 feet beyond them; the plan exhibited clearly defines where the bar is.

4768. Does it lie within the pier heads?—No; without the pier heads; and there is about four feet of water upon it at low water of spring tides.

4769. (*Mr. Webster.*) Perhaps you will have the goodness to ask upon that, Sir, whether assuming those piers of Mr. Walker's to be constructed there would still be a bar there?—Yes; there must necessarily be a bar at the mouth of every tidal river. Wherever tidal water is admitted on the one hand and passes out on the ebb on the other, the meeting of those two waters must cause a bar. But there may be a great deep estuary with no bar. For instance there is no bar at the mouth of the Firth of Forth. We have no bar at the northern mouth of the Thames, because the waters ebbing out there so unite with the ebbing waters of the North Sea as to create little or no bar. But if we take the southern side of the Thames, there is a very great bar, in the form of the Margate sand and numerous other sand banks, caused by the one tide from the north and the other from the Straits of Dover coming in contact with each other across the southern part of the estuary.

Adjourned to Wednesday, 7th March, at 11 o'clock.

Wednesday, 7th March 1855.

W. A. Brooks, Esq.

7th March 1855.

(*Mr. Seymour.*) SIR, before I commence my observations, perhaps you will agree with me that it will be convenient for Mr. Brooks to hand in the tidal diagrams. (*Mr. Brooks delivered in the same.*)

(*Mr. Brooks.*) These are observations made in 1854, commencing on the 7th September and ending October the 6th; the dates are, the 7th, 8th, and 9th of September, the 22d, 23d, 24th, and 25th of September, and the 5th and 6th of October. I also produce reduced charts of the Tyne of 1813, 1849, and 1854. These three are coloured, and there are also three copies with the contour lines, in case the Commissioners prefer the one to the other. I also produce two parts of the river Tyne: Wallsend Bight in 1813, and the same in 1854. There was a question put by Mr. Webster to ascertain the acreage included within the river lines and the shore. Supposing the whole were enclosed, without Jarrow Slake, it comes to 322 acres and eighty-five hundredths. That includes the Hay Hole docks, which occupy 72 acres and ninety-six hundredths of an acre, and also the enclosure of the convex shore opposite Wallsend Bight, which it did not, in the first place, form part of my intention to enclose. It was subsequently ordered to be enclosed by the Tyne Improvement Commissioners to the level of half tide. These two should, properly, be deducted from the 322 acres: that will leave 212 acres and seventy hundredths of an acre, the original lines being 201. I have also one or two charts here which may be of use; charts of the Humber, the Bridgewater River, and several other rivers. Perhaps they may be allowed to be on the table as the Inquiry is going on. They have been referred to in the previous evidence.

4770. (*Mr. Webster.*) You say that what you now propose to enclose is 322 acres, as compared to 201 acres that were in the original lines?—Yes.

4771. What lines are you referring to when you give that quantity?—The lines agreed upon at the present day. My last lines, we will call them the lines of 1854, being very slight modifications of the original lines of 1842.

W. A. Brooks, Esq.

7th March 1855.

4772. On what plan are those lines laid down which give this acreage of 322 acres?—Upon the plans produced before the honourable Commissioners at the examination at Newcastle.

4773. They are upon that which you say was the plan produced at the Commissioners meetings?—Yes, in the last few years.

4774. You produced two plans, the plan of 1843 and the plan of 1854?—Yes.

4775. In what respect, as regards acreage does the plan of 1843 differ from the plan of 1854?—The difference is between 201 acres and 212 or thereabouts, with the exception of the dock, because the Hay Hole Dock will still remain as water, and the tide will have the power of going through the entrances when required, 70 feet entrances and 52 feet entrances, so that the enclosure would be available if required; not that I should recommend that to be adopted, because of the silting up which would take place, still it is available.

4776. You told us that you had no lines laid down, I think, in Shields harbour?—In 1843 I had lines laid down in Shields harbour.

4777. But now upon the Commissioners' plan you have no lines laid down there?—No, there are none agreed to.

4778. Then this acreage is quite exclusive of anything in Shields harbour?—Certainly.

4779. What is the lowest point in the river at which this acreage begins?—It goes down to Hay Hill Point.

4780. Then this acreage is westward of Hay Hill Point?—Yes.

4781. What is the width of the river between the walls at Newcastle? We are now upon the Commissioners' plan of 1854. What is the width of the river between your walls up at Newcastle, at any convenient point at which you can give it?—About 400 feet; one part of the river there in its present state is only 350 feet between the quays, but it is generally about 400 feet.

4782. Which is the part that is only 350 feet?—Abreast of the old quay; it is about 800 feet below the old bridge.

4783. Are the walls complete at Saint Lawrence, or anywhere there?—No.

4784. What is the width opposite Saint Peter's Quay?—Opposite Saint Peter's Quay, in its natural state, it would be about 650 feet; there is a bight which we enclose there. That is opposite the bight above Friar's Goose Point, where an enclosure is proposed to take place.

4785. Then the present high-water area, at a 15 feet tide just above Friar's Goose Point and opposite Saint Peter's Quay, being 650 feet, what will be the full-tide area between your lines if executed?—I have not the lines laid down, but I can speak from memory, about 450 feet. That plan is not here, it was not ordered to be brought up. This only shows the river in its present state, where the walls are made, and where you can get the width.

4786. Have you not here the Conservators' plan?—No, all the plans were put into the hands of the Secretary of the Commission, and a certain number were selected.

4787. Have you brought no plans of your own at all?—Only these plans; but I can give you any evidence from my knowledge of the river.

4788. Do they differ materially from your parliamentary plans?—No, they do not.

4789. Then we will take those: they are the same, are they?—Yes, the same exactly; there is no alteration in the Parliamentary plans at that part.

4790. Then this acreage, and so on, to which you have referred, will apply equally to the Parliamentary plans as to what you call the Conservators' plans?—Very nearly so; there is a very slight alteration made. The width is 462 feet. Mr. Rendel's lines of deviation are the same there.

4791. You have given me 462 feet as the high-water distance between the full-tide walls at that point. Will this Parliamentary plan show the present high-water surface?—Yes.

4792. You had better measure it to the same scale and see what you measure here at that precise point, that we may only use one plan?—About 640 feet; and immediately below, at Friar's Goose, it is only 373 feet.

4793. You take the present high water at a 15 feet tide?—Yes.

4794. Just let us take it at Saint Anthony's Quay?—At Saint Anthony's Quay, at the point, it is 395 feet, from memory, at the narrowest part.

4795. Do not let us have it from memory. I want the present high-water distance and what it will be with those walls there?—396 feet is the present distance.

4796. What will it be?—It is proposed to cut off there 66 feet.

4797. Then between the walls at that point it will be what?—462 feet, supposing the point at the Lead Works is cut off.

4798. It is now 396 feet at the high-water surface?—Yes.

4799. And you propose to cut off 66 feet and make it 462?—Yes.

4800. Will you take it just above Bill Point; what is the widest section?—I have given you all this upon my previous examination.

4801. But not upon that scale?—Yes, the same; you have put a good many questions upon the very same points.

4802. You talked about an enclosure at Hebburn Quay just now: what is the present high-water surface at Hebburn Quay, opposite Low Walker, that appears to be about the widest space?—Which part of Low Walker will you have.

W. A. Brooks, Esq.

7th March 1855.

4803. I will take any you like, as a matter of comparison ; any that it is convenient to measure from ?—Shall I take the broadest or the narrowest, or a mean ?

4804. Take the broadest.—957.

4805. And what will it be between the walls ?—780.

4806. There is a very large estuary, so to speak, which Mr. Walker referred to, or was referred to by Mr. Brunel, between Wallsend and Wallsend, as it is shown here, that is the Dean and Chapter land ?—Yes. I do not recognize the term "estuary," I think it is quite misapplied.

4807. Then we will call it this Dean and Chapter land at Wallsend. What is the width there ?—1,914 feet.

4808. And what will it be between the walls ?—815 feet.

4809. You have given us these areas, you have not given us the cubical contents so as to show the quantity of tidal water that will be displaced ?—No.

4810. You have not calculated those ?—I have not. That of course depends altogether upon the action which will take place on the bed.

4811. Not within the high-tide walls ?—It will depend upon how far the low-water surface will be reduced.

4812. You have not any corresponding cubical contents of the portions of the foreshore that will be obstructed, supposing these full-tide walls are built to which your 322 acres apply ?—No, I have not those ; they have been taken by some other parties.

4813. You have handed in nine tidal diagrams, have you not ?—I believe so.

4814. What is the difference of the time of high water at Newcastle and Shields, as shown by those diagrams ?—It varies very much ; it varies from 45 minutes to 55, and an hour and five minutes. There are several 45 minutes.

4815. As there are only nine, will you tell me exactly what are the precise times of the difference of high water from those tidal observations between Shields and Newcastle ? We will take them in order of date ; we will begin with September the 7th ?—From the station at North Shields, on the 7th of September, the difference was three quarters of an hour.

4816. Now the 8th, if you please ?—The morning's tide of the 8th of September was exactly an hour ; the afternoon's tide of the 8th was 50 minutes. The morning's tide of the 9th was exactly an hour ; the afternoon's tide of the 9th was an hour and five minutes. The morning's tide of the 22d of September was one hour ; the evening's tide of the 22d of September was one hour. The morning's tide of the 23d of September was an hour and ten minutes ; the evening's tide of the 23d of September was fifty-five minutes. I have not the morning's tide of the 24th of September, I suppose the man was away from his post ; the evening's tide of the 24th of September was fifty minutes. Then the morning's tide of the 25th of September was three quarters of an hour. The evening's tide of the 5th of October was fifty-five minutes. The evening's tide of the 6th of October was one hour and five minutes ; that is all. I may perhaps take this opportunity of saying that I believe there has been no record made of the questions which I put to Mr. Rendel in reference to the important sections by Mr. Giles of 1813. Mr. Rendel made an observation that according to Mr. Rennie's surveys, or tidal observations, high water was a dead level. Then I put a question through the learned Counsel to Mr. Rendel as to what he observed on the old tidal sections made by Mr. Giles for Mr. Rennie in 1813, showing that instead of the tides being at a dead level, or rising to the same height at Newcastle as at Shields, one tide I observed was 10 inches below the level of high water at Shields, and several 7, 5, 4 and 3 inches, and that the datum tide of Rennie had merely been selected I supposed for convenience of reference, as being a dead level line. As I have found in my own observations, none of those tidal observations show a depression to the extent shown in 1813. You will find that the high-water surface at Newcastle is nearer now to the level of high water at Shields.

4817. (*Mr. Brunel.*) As these tidal observations which you have put in appear to be some of the most important documents which we have had yet, I want to ask you exactly what means were taken to ensure very perfect accuracy in them, because it is a question of inches as between the bar and Newcastle ?—The tide gauges were carefully levelled ; they were levelled by Mr. Comrie and by myself, and we had observers at a great many stations ; they were so close together that if one man failed to do his duty he was immediately checked by the observer on each side.

4818. What sort of gauges were they ?—Boards about 9 inches in width, and the 15 feet mark was a dead level throughout, carefully levelled and checked over.

4819. Were the boards divided by a scale ?—They were divided into inches, and the observers took the tide every five minutes, day and night. As far as the night was concerned——

4820. Do you say that these were checked by Mr. Comrie ?—Yes ; some of them were his original gauges, put down in 1849, and not altered since.

4821. Were they examined since ?—Yes.

4822. Levelled by him since ?—They have been levelled by myself since ; they were used by him upon his surveys ; his last soundings were taken from the same marks ; they were generally spiked into the ends of the jetties.

4823. When you say that you levelled them yourself, do you mean that you actually did so, or by somebody else ?—I levelled them myself.

4824. Then you can vouch for the perfect correctness of the gauge at Newcastle ?—Yes ; and it has been done very carefully, and checked over again.

W. A. Brooks, Esq.
7th March 1855.

4825. And the same as to these observations?—Yes; I believe they are correct. There have been a few discrepancies found, where the men have left their posts from fatigue or cold; but there I have put dotted lines. A man has gone away from his duty for a quarter of an hour; it is a close duty, every five minutes day and night.

4826. Is there any record, whether there was much or little fresh at the time of these different tides?—You will see that where there is a derangement of the tide, there is a notice of a fresh being in the river at the upper part, where the tide ran down during the entire time of the flood tide.

4827. I mean as to the generality of them, is there any memorandum or record of what was the state of the river at that time?—There are several observations in the books made by the parties. I can put in the original documents, if you please. I have brought them with me on purpose.

4828. A memorandum attached to each diagram, which had been made at the time, of the state of the river, would have been valuable?—With the exception of one, those observations generally show that the river has been tolerably free from freshes.

4829. What I want to avoid is, drawing a conclusion from those documents of what ought to have been the state of the river. I want the fact?—At Newcastle you will find that the low-water surface is about a foot lower than the old state of the river.

4830. That is not what I am thinking about at all. I merely wanted to know whether there was any record of the state of the fresh water, and what was the wind upon these days?—Yes, you will find upon those charts copies from the books kept at Shields; you will see, looking at the high-water surface, the state of the wind. I can put in the original ones. The Shields' Harbour-master's Assistant gives the tides exceedingly well.

4831. Is that here?—It is there put in pencil, but I can put into your hands the original books.

4832. Will you show it to me here?—Take this tide of the 23d of September; the wind was north-west, and then above is put in pencil from the book a record in detail about the time of high-water, and then the low-water surface also. Those observations at Shields were taken by a very careful observer indeed.

4833. And as regards the state of the river fresh, is there any similar memorandum?—Not at Shields.

4834. Of course not; but as to the state of the river as to freshes?—It is only occasionally mentioned, I see, in the books.

4835. (*Mr. Armstrong.*) You only mention it when there is something striking?—When there is evidently a fresh.

4836. (*Mr. Brunel.*) You mentioned that the dock water you calculated as available as tidal water?—It might be used to scour with; but I would not recommend it as a professional man.

4837. As an engineer, do you mean that it is available?—I do not think that it would be available, as an engineer. I mean to say that it is water, and not land.

4838. (*Captain Fitzroy.*) Was the period at which the date of these sections were taken when the river is lowest generally, in the autumn, September and October?—That was the time when Mr. Comrie made the survey.

4839. Is not the river in the autumn lower generally than at other times?—Generally it is.

4840. And, therefore, not liable to particular freshes?—Not liable to freshes, I should say. Many observations which I have taken in summer months show quite as low a level at Newcastle. I have some observations showing only 2 feet 4 upon the gauge at Newcastle.

4841. These documents are chiefly the result of the late Mr. Comrie's work, are they not?—While his soundings were going on, these observations were made.

4842. Is this handwriting Mr. Comrie's?—No, some is my son's, and some my own. You will observe from many of these tide gauges, that when there is quite a foul ebb at Shields, there are lower ebbs at Newcastle than there used to be upon a very clean ebb at Shields.

4843. Are these the original documents, or copies?—They are the original documents made out from the books. I have not any copies of them myself.

4844. Mr. Comrie did not himself lay down these diagrams?—No; the only diagrams laid down from Mr. Comrie's are those in 1849, and they form part of Mr. Rendel's appendix. I have taken them in a different way.

4845. These diagrams of 1854 are laid down by yourself and your son?—Yes.

4846. Then they are entirely your work, and not Mr. Comrie's work at all?—Just so.

Mr. Seymour.

(*Mr. Seymour.*) WE now, Sir, approach the close of this important Inquiry, and I think I am justified in saying that the importance of it is not merely of a local character, but that if we can rise above the mists which seem to a certain extent even to affect the judgment and feelings of some of the witnesses who were called before this Commission, we can see from an elevation so taken that there are questions before you of an engineering and scientific, and practical character, both as to the training of rivers and as to the proper mode of effecting improvements at the entrance of tidal harbours, of very great, and, in fact, national importance.

Mr. Seymour.

7th March 1855.

Sir, I shall not allow myself, although sensible of the value of this opportunity, and of the many new suggestions which I might make on the former evidence, to abuse the kind indulgence which the Commissioners have shown in allowing me to add some supplemental observations to the speech which I addressed to them at Newcastle, in there summing up the evidence. I understood the Commissioners to reserve for me the right to refer to the new evidence which would be called before them in London, and to address to them any comments which I thought that evidence justified me in making. I shall therefore, Sir, travelling as little as I can out of the limits so assigned to me by the Commissioners, make the observations which I think the evidence that has been given during this second stage of their proceedings justifies me in offering.

Sir, the first witness who was called before you, and who was called, as my learned friend stated, at the express wish of the party whom he represents, (he made the application at Newcastle, and he used the same language then which he has repeated here,) was Mr. James Meadows Rendel. Sir, no one can mention Mr. Rendel's name without feeling the respect which great talent and which an eminent public position deserve; but, at the same time, contrasting for one moment the mode in which Mr. Rendel gave his evidence with the mode in which, in my opinion, Mr. Robert Stephenson gave his evidence, I think we may see the distinction between witnesses, who, by their evident impartiality, secure a ready confidence, and those who, however respectable they may be, or however eminent their station may be, sometimes introduce a little of the feelings of the advocate and of the partisan, and betray a desire, not so much that truth may conquer, as that their own peculiar views may prevail. I confess, a good deal fell from Mr. Rendel which seemed to me to be a strong contrast both in spirit and style to the evidence which was afterwards given by the other eminent engineer, and the manner in which he gave it. However, with regard to Mr. Rendel personally, I shall make no further remark, and in making these, I hope I am not travelling beyond the bounds of propriety or of justice.

Now, Sir, one observation at the outset, I think, could not but have suggested itself to the minds of some of the Commissioners; that is, the apparent inconsistency on the part of the gentlemen in the minority in calling Mr. Rendel before you, and insisting upon his views, especially with regard to the piers, but not only with regard to the piers, but also with regard to his particular plan of half-tide training walls. Sir, Mr. Rendel's suggestions were before the Tyne Commission, and I defy my learned friend, or that gentleman who now sits by him, Mr. Stevenson, with all his activity or zeal, or any scrutiny which he may bring to bear upon the Minutes of the Commission, to show any notice of motion, or any effort to obtain the adoption of Mr. Rendel's plan, for the training of the river by half-tide walls. And as to the question of piers, Sir, not only has Mr. Rendel's idea, his outer piers and his inner piers, and his general scheme for the improvement of the entrance of that navigation, not been adopted, not only has it not received the sanction of Mr. Stevenson, who seems the most active of the minority, and of those who generally act with him, but a resolution of the Commissioners has already been read, to which I shall refer as justifiying me, I think, in coming to the conclusion, and asking you to do the same, that the conduct of this minority seems strangely inconsistent, in now, at the eleventh hour, making so much ado about Mr. Rendel's peculiar views upon the subject of the piers at the mouth of the Tyne. Sir, on the 6th of November 1851, I find that there was a very large attendance of the River Tyne Commissioners, and the following resolution was then adopted, which has not been since altered, or if it has been, I have no doubt the acumen of my learned friend will discover it. "Mr. Philipson moved, and "was seconded by Mr. Lowrey, that the short inner piers laid down on Mr. Rendel's plan "be omitted from the Parliamentary plan to be deposited, but that the Commissioners are "ready to execute an experimental short pier on the line of Mr. Rendel's plan, on the south "side of the river, out of the general funds of the Commission," if (what a hypothetical compliment to Mr. Rendel!) "it shall be found requisite after the completion of the outer "piers, and if, on such experiment being made, it be found desirable, a similar pier be "erected on the north side of the Narrows. Mr. Linskill moved as an amendment, and "was seconded by Mr. Straker, that the two inner piers or walls recommended by "Mr. Rendel be included in the Parliamentary plan, which amendment on being put was "negatived on a division, there being for the amendment two votes, viz. Mr. Linskill and "Mr. Straker, and against it twelve votes." And I find that among those twelve who voted in the majority against the introduction of those inner piers on the Parliamentary plan, was Mr. Stevenson! My friend's chief promoter, and the instigator of all these proceedings! Now, Sir, it may be said, no doubt, that in this resolution, there was the sanction of the idea that an experimental pier might be tried, and that afterwards, if thought necessary, inner piers might be formed. Sir, Mr. Walker himself in his report states, and I think all the evidence tends to that conclusion that there is no impossibility, in the event of such a thing being supposed to be desirable, to its taking place. But I am not commenting so much upon that part of the resolution as upon the general and absolute terms of that resolution, and the absence of any other resolution at all qualifying it, which I think entitle me to say, that there has been no attempt on the part of that minority, as evidenced by the minutes contained in that book, to obtain the sanction of the Tyne Improvement Commission to the plan of piers advocated or recommended by Mr. Rendel. And therefore, Sir, I do say, that remembering that this matter was scarcely noticed by my learned friend at the conclusion of his speech at Newcastle, to attempt now

Mr. Seymour.
7th March 1855.

at the eleventh hour to make out a case against the Commissioners, supported by the evidence of Mr. Rendel, with reference to these piers, seems to me a course not consistent with the conduct which that minority have hitherto pursued, and ought to stultify them before any candid observer.

Sir, the evidence which Mr. Rendel gave appeared to me to divide itself, as did the evidence of all the witnesses called before you, into that which related to the training of the river, and that which related to these piers at the mouth of the river. And whether the piers are looked upon as distinct works, as seems to have been done by Mr. Walker, or looked upon in relation to the river, as was done by Mr. Stephenson and Mr. Rendel, I think the evidence throughout of all the witnesses will divide itself into these two general heads, and I propose dividing in a similar way my remarks on each witness, as briefly as the nature and the importance of the task will allow me to do.

Sir, there is one observation which I submit to the Commissioners I am entitled to make with reference to Mr. Rendel's report of 1851, as compared with his evidence given before this Commission, upon the subject of half-tide walls. It appears to me that there is a great inconsistency in the language now used by him, as compared with the language which he used then; but my learned friend will have an opportunity, no doubt, when he comes to reply, of explaining away that inconsistency, if I am wrong in using the expression. In Mr. Rendel's report I find that he uses the following language: "With half-tide banks, having openings as proposed, there would be a strong shore "current from half tide of flood to half tide of ebb, and the stream through the openings "would, as the impounded water passed off, tend to keep them clear to a convenient "depth for access to the shore." Now, Sir, it is quite clear from the language used by Mr. Rendel there, although a few lines before he refers to the tendency to an increase of deposit between the shores and the half-tide banks, yet that he thinks that tendency is so slight in its operation, or so distant, and the effect of the tide upon the formation behind these walls so calculated to neutralize that tendency and obviate its injurious results, that he evidently does not consider that there would be an injurious abstraction of tidal water by his proposed half-tide walls. Sir, when Mr. Rendel was examined before this Commission, he also referred to the calculations of Mr. Heppel in 1851. Now we have not got these calculations before us.

(*Mr. Webster.*) The reports are here; I shall refer to them, certainly.

(*Mr. Seymour.*) Sir, I think it will be found that those calculations were made upon the basis or assumption that there would be no abstraction of tidal water behind the half-tide training walls. Therefore if that be so, I am entitled to press the calculations of Mr. Heppel, as strengthening the conclusion that in 1851 Mr. Rendel regarded half-tide walls as not liable to cause any sensible abstraction of tidal water.

Now, Sir, I will call the attention of the Commissioners to Mr. Rendel's evidence, given on the 8th February before them. I find that in answer to a question from Mr. Brunel, he uses the following language: "Do you think that after these half-tide training "walls have been constructed and in operation for some time, the space at the back will "remain so deep as it was?—*No, certainly not.*" "Do you think that generally speaking "it will silt up to the level of the half-tide walls?—No, *not quite* to that." Sir, without pausing at any greater length upon that evidence of Mr. Rendel, it appears to me that when he writes in his report about "keeping the spaces behind the half-tide walls clear "to a convenient depth for access to the shore," and when he afterwards speaks in his evidence before you the other day of a silting up behind these walls, "not quite" to the half-tide level, there is an inconsistency between those two views, which justifies the observation that Mr. Rendel in this, as in other parts of his evidence, when contrasted with his report, to which I shall refer afterwards, seems not to have a strong, well-defined, settled opinion, founded upon his own experience, but seems to have modified his views from time to time, and his present opinions appear very much more to coincide with those of Mr. Brooks and Mr. Stephenson, than those which he entertained when he wrote his report in 1851. Probably within the next four years he will advance to the full-tide level.

Sir, having referred to the report of Mr. Rendel, there is this observation to be made, when we look to the early pages of his report, where he speaks of the effect of "training" the river, and of the result likely to be attained thereby, that regarding him as enunciating a principle, he appears to me strongly to support the views for which we contend, although the particular mode of training the river upon which Mr. Brooks has insisted is so different. I find Mr. Rendel in page 6, writing as follows: "Between Howdon and "Bill Point the requisite improvements must be effected by 'training' the river; that "is, by confining its stream within a limited width, and in a direction that will ensure "the greatest uniformity of current for the ebb-tide and land waters, as well as for the "flood stream; thereby not only increasing the duration and column of the latter in the "higher reaches of the river, but also the power of the back-water, fresh and salt, to "maintain an efficient scour and good navigable channel." Now why, as a matter of principle, Mr. Rendel ends there, why that which he finds would be the result of training the river in that part of the stream would not also result in other parts, or why he should deny to full-tide walls what he attributes to half-tide walls, I am at a loss to conjecture. I find that on the next page, page 7, he says, that training the river between Brandling Main and Friar's Goose Point, "would give a tidal column at Newcastle

Mr. Seymour.

7th March 1855.

"Bridge of 14 feet 6 inches, or from 2 feet 6 inches to 3 feet more than at present, and "hasten the time of young flood about an hour." And referring to the effect above bridge he says, "I have no doubt but by these works the inclination of the low-water "surface of the river might be reduced to between three and four inches per mile up to "Lemington, and thence to Hedwin Streams to between 4 and 6 inches per mile. This "would give a flow at spring tides of 13 feet at Scotswood, and 12 feet at Newburn, "the flow at present being from 9 feet to 10 feet at Scotswood, and 4 feet 6 inches to "5 feet at Newburn. As to the low-water channel, it is at present so irregular and "variable, that it partakes of the character of a mountain torrent rather than a navi-"gable river. This is mainly due to its extremely tortuous course between Scotswood "and Newburn, and without straightening it, I think all attempts at improvement "would end in disappointment." He adds, "To justify this opinion, I need only state "that these bends, and the consequent irregularities which they cause in the sectional "area of the channel, obstruct the land floods to such a degree that they attain a fall of "nearly 17 inches per mile between Hedwin Streams and Newburn." He then gives other calculations showing the effect of the fall upon the river. Now, Sir, I pray in aid, as a matter of principle, these observations of Mr. Rendel, as supporting the view that a contracting of the channel of the river, and a training of the river by a system of river walls, is an important mode of carrying on and effecting the improvement of the navigable channel of that river. No doubt Mr. Rendel guards himself in his report against supporting the full-tide walls; but as a matter of principle, looking at the results to which he refers as being the likely consequences following training walls to the half-tide level, I think I am justified in saying, that, regarded in that light, we are entitled to pray these observations in aid, with reference to our plan of full-tide walls. We at least insist on the same arguments in support of our opinion.

Sir, in the course of Mr. Rendel's evidence upon this question of the half-tide walls' I called his attention to a report which he had once written upon the Belfast Lough. Had Mr. Rendel in that report confined himself to observations strictly local in their character, and bearing upon the characteristics, if I may so speak, of that particular port, possibly the production of that report would not be so important as it appears to me to be when we consider the strong unqualified language in which, in a portion of that report, he expresses himself. Mr. Rendel writes as follows: "It is a conviction upon my "mind that to permanently secure a straight channel it must be, to some extent at least, "retained within banks more or less artificial, and that the more these banks are raised "until as high as high-water spring tides, the better the channel will become; in other "words, that any scour which the channel now or when embanked can permanently "derive from such portion of the tidal water covering the slobs as may happen to be "brought into it by the branch creeks, is of little or no importance compared with the "good that would result from having banks that should fix the limits of the stream for "the whole period of the tide, and concentrate upon the navigable channel all the "agitation that is found to result from the use of it by shipping of all kinds, but "steamers especially." Now, Sir, it appears to me that I am entitled to press this opinion of Mr. Rendel's given with regard to the Belfast Lough, and the importance of raising the walls there to a high-tide level, in aid of our operations upon the Tyne. No doubt it may be said, that Belfast Lough is a pure tidal receptacle, and that the governing influence of the Tyne is that of fresh waters; but instead of this weakening my argument, it strengthens the position which we have taken in pressing this as an authority in favour of the course which we have adopted. Mr. Rendel, when asked upon cross-examination with reference to this Lough, stated that it was no parallel, that Belfast was a tidal estuary, and there was not the smallest degree of analogy. Sir, that answer of "no parallel and no analogy," appears to me unfortunately to pervade every illustration, or almost every illustration, to which Mr. Rendel has referred. He refers, for instance, to Montrose harbour, and when pressed, I think the Chairman asked him what improvements had been effected at Montrose harbour, the answer at once was, that "it required no improvements!" Then why refer to Montrose harbour as giving an analogy so far as river works are concerned? It was used by Mr. Rendel for two or three purposes; at one time to show the configuration of the headland, at another time as supporting his particular view with reference to piers at the mouth of the river. Then with regard to Wells, and with regard to the Clyde, and other rivers or navigations to which Mr. Rendel has referred, I always find that after he gives an illustration, when I asked him how far it threw light upon the question of actual works upon the Tyne, the cases are "not at all analogous;" and as he left the case, excepting in the instance of the Tay, upon which he has not given us any very full explanation as to where the similitude lies, I am not aware that he has mentioned a river or a navigation in which he can speak from his own experience of an analogy bearing in favour of the views which he entertains; neither am I aware of any case in which Mr. Rendel has himself, according to his own evidence, had any practical experience in the improvement of a river. He has reported upon this river, and upon that navigation, and upon this harbour and the other; but I am not aware that he has been able to point out, indeed, he has not been able to point out, because he was distinctly asked the question, either in the Tyne or elsewhere, a single instance where works have been practically carried out, or to which he can refer as a practical illustration of the particular views which he entertains with

Mr. Seymour.

7th March 1855.

regard to half-tide training walls. Sir, I think I am justified in what I have just said, because Mr. Rendel was asked this question, "Has anything occurred in the River Tyne, "have any works been executed, and any results obtained within your knowledge, that "would support what I may call your view of the case?—I do not know that there "have; there have been some half-tide training walls there, *I believe*, and *I think*, as far "as those training walls have gone, the result has been satisfactory." Sir, if Mr. Rendel did not know of any place in the Tyne to which he might point for some proof of the wisdom of his views with regard to training walls, and yet has referred to no other river, I think I am entitled to ask you to come to the conclusion that, although we have evidence distinct and positive of cases in which full-tide walls have operated beneficially, however he may deny the "analogy," we have no evidence, even by Mr. Rendel, the great advocate of this half-tide system, of any case, either within his own experience or which exists elsewhere, where the system of half-tide training walls has led to the results which he prophecies with regard to the training walls which he recommends for the Tyne. And, Sir, not only is there an absence of evidence, but I find Mr. Rendel recommending a course, with regard to the Tyne, which I confess surprised me a good deal. I am certainly not an engineer, and, perhaps, incompetent to criticise, as I am now doing, the evidence of so great an engineer, but it strikes me as strangely inconsistent and unscientific to find him saying "I really want, if it is to be a matter of experiment, to see "it carried out a little more fully. Let us put half-tide guiding walls in one part under "favourable circumstances, and put your full-tide groins, defining the depth of your navi-"gable channel in the other case." Why, Sir, here we have Mr. Rendel seriously recommending the setting up, as an experiment, of two systems in one river!

(*Mr. Webster.*) That was in answer to a question.

(*Mr. Seymour.*) Yes; but it is his advice for all that. That is to say, half-tide walls he wishes to see tried in one place, and full-tide groins in another, in order to experimentalize upon this matter. I say, would Mr. Rendel have suggested such a course, if he could have prayed in aid any practical illustration of the views which he entertains?

(*Mr. Webster.*) You do not mean to say that Mr. Rendel recommended that?

(*Mr. Seymour.*) My friend's surprise is admirably affected; but I am sure he will adopt the course (not exactly following the example which was set by Mr. Stevenson at Newcastle) of not again interrupting me. I have read Mr. Rendel's answer. I have not, therefore, misstated the evidence; if my learned friend differs from the conclusion which I draw from that answer, he will have an abundant opportunity of explaining it, and if I am present, I shall be most happy to hear his ingenuity exercised in so doing, nor shall I spoil its weight by any interruptions.

Sir, so far I think the observations which I have made are justified by the evidence or by the extracts which I have read from the report of Mr. Rendel; but, Sir, I find in the course of this case that he makes several important admissions, which if we did not know that he has given opinions so very much opposed to them in other parts of his evidence, would be strongly in support of the views practically carried out in the Tyne by Mr. Brooks, and sanctioned by the authority of Sir William Cubitt and Mr. Robert Stephenson. For instance, Sir, when Mr. Rendel appeared before you on the 12th of February, I find him using the following language: "If the quantity of water required "could be obtained above Newcastle, then it would doubtless be best to have the channel "between the sea and Newcastle put between high-tide walls; but this is not practicable, "and hence we come back to a necessity for having our reservoir below Newcastle, and "providing it in a manner that will be attainable at a justifiable expense." Now, Sir, I merely refer to this opinion of Mr. Rendel as valuable in point of principle. I pray it in aid, because if we can overcome that which is his difficulty in arriving at a conclusion in favour of high-tide walls, namely, supplying an increase of the tidal reservoir by the lowering of the low-water surface of the river, and the deepening of its bed up as high as Newcastle, then I think that the ground upon which he has qualified that opinion will be done away with, his proposition will no longer be conditional, and he will become an authority in favour of the views of Mr. Brooks.

Again, I find Mr. Rendel using the following language:—This is a question which was put to him. "As a matter of abstract theory, full-tide walls will propagate the tide "perhaps better than half-tide walls?—*No doubt.* Do you know whether, as a matter "of practice, there have been any observations made which enable you to ascertain "whether practice agrees with theory upon that point?—*No, I do not.* But as a "practical question, you do not apprehend that the difference would be very considerable? "—*I do not.* As regards the land floods in the case of the Tyne, it is clear that there "could be no difference, because land floods would always be confined within the half-tide "banks." Sir, here we have Mr. Rendel again admitting that as a matter of theory and principle, as distinguished from what he considers his particular view of the condition of the Tyne (which, after all, he himself only rests on theory), the argument is in favour of full-tide walls, and we are left in that position, principle, according to Mr. Rendel, being with us, and no practical illustration being offered by him as to whether or not any variation or qualification of this principle ought to be carried out. Nay, he writes and speaks in favour of a system which he admits to be not so good in principle, and in support of which he can point to no examples in practice.

Then, Sir, upon the question as to how far Mr. Rendel is an authority in favour of the

Mr. Seymour.

7th March 1855.

principle that by carrying the tidal column higher up the river, and by deepening the channel of the river, improvements are likely to be effected, there are some other parts of his evidence which, I think, will strongly support the views which are entertained by the majority of the Tyne Conservancy Commission. We will take, for instance, a question which my learned friend put, and upon which at the time I remember making some remark, as I considered it put with a good deal of art; perhaps he will remember the question when I call his attention to it. He is examining Mr. Rendel after Mr. Stephenson has previously given evidence, and if you recollect, Sir, Mr. Stephenson was pressed as to what in extreme cases, which my learned friend put, might or might not be the effect of, for instance, narrowing the channel to an exceedingly narrow limit. Mr. Stephenson guarded himself by the reply that, of course, if people wished to go to an absurd length, his argument would not accompany them. But my learned friend made use of that admission of Mr. Stephenson in the following question which he put to Mr. Rendel: "But "I presume you would agree with Mr. Stephenson, for instance, that the tidal area might "be reduced to such an extent, that you would have a less flow, of necessity, at New-"castle?" Now, how far Mr. Stephenson exactly said that the Chairman will remember. I recollect at the time entertaining some doubt upon my mind; however, the answer is remarkable, and appears to me to be an answer in favour of the views which we, in common with Mr. Stephenson, entertain. "Yes, unless you deepened the river at the same time, "and got the whole tidal column. You cannot get more than the whole tidal column." Now, Sir, it does appear to me that that answer, which was given by Mr. Rendel to the question of my learned friend, supports the view which we entertain as to a deepening of the river, which would admit the tidal column into its bed, so that the whole practicable energy of the water might be brought to bear in scouring the navigable channel. It appears to me that that answer of Mr. Rendel supports the views which we entertain, and is perfectly consistent with the evidence given by Mr. Stephenson. Mr. Brooks says he *can* "deepen the river, so as to admit the whole tidal column."

Sir, I find Mr. Rendel also giving the following replies to me in cross-examination: — "Supposing that the effect of the works upon the Tyne is to reduce at Newcastle the "low-water surface of the river, would you consider that evidence of improvement or "not in the operations upon the navigation of the river?—*Certainly, so far as it goes.* "At Newcastle whatever works depress low-water and raise high water, or, in other "words, increase the column of tide, are evidence that improvement has been going on. "You said that as a general principle you were opposed to the abstraction of a quantity "of tidal water from the river; may not that be to a considerable extent compensated "by the increase of the momentum of the stream?—I said so; I said just now that I "would readily sacrifice a large quantity of tidal water near the mouth of a river in "order to get a comparatively smaller quantity of increase higher up the estuary." Now, Sir, Mr. Rendel we here find making an admission or enunciating a principle which appears to me, as far as it goes, to supply an argument in favour of the views which we entertain. It is true he again qualifies his answer: he says that with regard to this "sacrifice," as he calls it, of a quantity of tidal water, he would readily give it, *provided* he had an increase higher up the estuary. Now, first, Mr. Stephenson and we deny the sacrifice as a matter of fact, because we say there will be no abstraction. And, secondly, we say that, admitting by way of argument an abstraction, still if by deepening and narrowing the channel we cause the energy of the deep waters to bear with such increased influence as to make the river, in Mr. Rendel's words, the workman of its own improvement, we shall be carrying out that very view for which Mr. Rendel is going to make this sacrifice. Now, Sir, this appears to me to be another part of the case in which the evidence of Mr. Rendel left, as it is without any illustration in point as to where an experiment has been made of his own views, is a strong argument in favour of the views which we entertain, and which we have been carrying out with success in practice.

Sir, passing therefore from this part of my observations upon Mr. Rendel's evidence, I would refer you to what he said as to the causes which operate in the formation of the "Insand" and the "Herd Sand" and the "9 feet bar," showing upon these points, as it appears to me, either a want of personal practical acquaintance with the condition of the Tyne, or a mistake in taking for granted the elements of the argument which he adopted when he expressed the views which he did before you. In Mr. Rendel's evidence I find the following, "My belief is, that if you carried Tynemouth Head a mile "further to sea, the Herd Sand would follow it—it is the result of the strong eddy formed "by that head." Then we find him speaking of the "Insand." After describing Tynemouth headland as being a great groin, the effect of which is to throw the current of flood past the entrance of the harbour at times, he says, "Of course, if the flood tide "overruns the harbour's mouth, it is manifest it will accumulate faster outside the mouth "than it does up the harbour, and then a rush takes place, and hence what is called the "'wheel' over the Herd Sand in the case of the Tyne, which everybody knows. That "makes what is called the nine feet bar on the one side and the Insand on the other." Now, Sir, when I have it in my power to call the attention of the Commissioners very shortly, as I will do, to the observations of Mr. Brooks, and the mode in which he accounts for these formations in the river, I would rather not trust myself to express his views, when I am enabled to read in his own language how he accounts for these two results. Sir, two reports are before you of Mr. Brooks upon the improvement of the Tyne, in

Mr. Seymour.
7th March 1855.

which he criticises with singular ability and felicity of language the opinions upon the river and suggestions for its improvement made by Mr. Rendel. I will first call your attention to Mr. Brooks' first report, at page 28, where I find him writing as follows: "From the above features of Shields Harbour, we have during the ebb tide a constant "deposit or accretion of sand upon the Droitwich, the Insand, and the Herd Sands, "their sites being out of the scouring influence of that power which produces the main "channel of the Tyne, viz., that of the ebbing water. From the previous description "we learn that during the whole of the ebb a constant deposit of sand takes place "on the Herd, and the influence is that the latter place would long since have been "converted into land but for the counteracting power of the flood tide and natural "tendency of on-shore gales to remove seaward objects within reach of the waves "impelled by them. It being that the course of the ebbing waters of the Tyne is "not over the Herd Sand, but in a more northerly direction, and that the deep water "channel is only found in the course taken by the current of the ebb, it must follow "that a serious mistake would be committed by anyone who planned a pier on the south "side of the river, or on the Herd Sand, with the expectation of thereby materially deep-"ening the water on the bar, since it is evident that a pier there can have no directing "influence upon the course of the ebbing waters of the Tyne, upon which the deep water "depends." Sir, with regard to the nine-feet bar, I find Mr. Brooks writing as follows, and the language which he uses in his second report to the Commissioners, at page 6, is, almost precisely identical with that which is employed by Mr. Walker in his report to the Tyne Improvement Commissioners; which has the better claim to originality of idea I need not pause to inquire:—"The nine-feet bar is really produced by the abrupt "crossing of the current of the ebb from the southern shore or Herd Sand, after having "been previously deflected towards the latter by the bank called the Stones." We find that Mr. Walker in his report suggests the removal of that bank, and attributes the formation of the nine-feet bar to the same cause. "With respect to the Insand, its "existence is notoriously due to the eddy made by the ebb tide in passing from the "southern concave shore above it to the opposite concave channel below, forming the "pool of North Shields; and so far from the current of the flood tide being the cause, as "stated by Mr Rendel, of creating the Insand (the site of the eddy on the ebb), "it really is the only element which at present prevents it being converted into dry land. "The flood-tide inlet into the Insand will readily satisfy anyone of this fact who pos-"sesses an opportunity of carefully examining the locality." Sir, Mr. Brooks has been examined before the Commission, and so has also Mr. Rendel. Mr. Rendel attributes the Insand and the nine-feet bar to the causes which he has mentioned, and Mr. Brooks to those to which I have referred. It appears to me, as a practical man, and looking at the matter as we have it before us, that the strength of evidence, both from common sense as well as reasoning upon the facts presented to us, is in favour of the conclusion at which Mr. Brooks has arrived. And then I say, that if upon these matters we find, on practical considerations like those which have entered no doubt into the conclusions which Mr. Rendel has formed, an error, either as a matter of fact or as a matter of principle, it must to some extent at all events diminish the weight which would otherwise attach to an opinion emanating from such an authority.

Now, Sir, upon this part of the case the Commissioners will remember that I asked Mr. Rendel a question, which seemed for a moment to disturb the serenity of his temper. He gave evidence with regard to the training of the river, as to the importance of commencing works at the mouth of the river, and not higher up the stream. It will be remembered that I asked him whether he had previously been examined before a Committee of the House of Commons in the year 1849, and whether the opinion which he expressed before you was or was not consistent with the view which he had then expressed himself as entertaining. We find him on the present occasion speaking as follows,—"The principle on which I went was this, not to take any more tidal water "from the Tyne than was absolutely necessary to constitute a reasonable and good sailing "channel up to Newcastle," (here is an admission, so far as it goes, in favour of abstraction of tidal water!) "and especially pending any works at the entrance to the "harbour, because it is rather premature to treat the internal economy of a river until "you know what has been the result at the mouth of it." There is no misunderstanding Mr. Rendel's opinion; it is quite clear, according to this, that you ought not to commence works up the river, or meddle with the internal economy of the stream, till you know the nature of the works at the mouth of it, and the result there obtained. I then asked him whether that opinion was one which he had always entertained, and I called his attention to a question which was put to him when he was examined in the House of Commons before the Committee in 1849. The question was this: "How "could you judge of your alterations in the river, unless you commenced by straighten-"ing the entrance and widening the velocity of the tide?" Now, mark his answer. "There are certain obvious things you must do in the upper part of the river. You can "get no really permanent navigable channel until you have so altered the shores as to "confine the flood and ebb tides in the same course, and the sooner you could do that, "the sooner you would really know what amount of alteration ought to take place at "the harbour mouth." Now, Sir, two answers, as it appears to me, more diametrically opposed than those of Mr. Rendel, the opinion expressed here on the 8th of February,

Mr. Seymour.

7th March 1855.

and the opinion expressed in 1849 before the Committee, could not well be conceived. One would think Mr. Rendel of 1849 was not Mr. Rendel of 1855. Mr. Rendel begged of me to allow him to take the report of the evidence home with him; he took two or three days to consider how he could reconcile these discrepancies. He appears again on the 12th, and what is his explanation? He does not reconcile them. He frankly owns he cannot. The only explanation which he seems to give is, that his present opinion is the result of greater experience, and is, therefore, more valuable. Now, Sir, I do not want to dwell too much upon that, or make too much of it; but if I was at all justified in the observations which I before made, as to the variance of opinion between Mr. Rendel's report and his evidence, or as to the alterations and instability of his opinions in the course of his evidence here when pressed as to a matter of principle, and especially upon his views with respect to full-tide and half-tide walls, I think that I am justified in viewing this circumstance as also showing that either from a want of much personal acquaintance with the Tyne, or from his having not attended very much to this particular question of the Tyne, his judgment has been very unsettled. At all events, there the fact stands; and such as it is, and from what the argument is worth, I press it upon the attention of the Commissioners. It may teach caution. It may postpone conviction.

Sir, a question was asked Mr. Rendel, which appeared to me to be a very important one, at the time of his last appearance before the Commission. It was put by the honourable Chairman. That was on February the 12th. "What we want to elicit are "questions of fact, and what Mr. Rendel recommends in the Tyne much more than what "he recommends in any other river." Then, "How long is it since you have seen the "Tyne yourself with your own eyes?—I think three years. Do you think at that time "that any encroachments on the tidal waters of the river, by jetties, embankments, and "other works, executed and proposed, had injured the navigation?—I did not think they "had up to that time." Then, Sir, how do we stand with regard to Mr. Rendel? Up to 1849 there is no inquiry. It is three years since he has seen the Tyne with his own eyes. What mode has Mr. Rendel of arriving at a conclusion with regard to the Tyne more satisfactory than we all have? Of course he has engineering knowledge; he is well versed in scientific problems and abstract theories; but what mode has he of coming to a conclusion more satisfactory than anyone in this room? He may institute a comparison of Mr. Comrie's last survey with the surveys in 1849, or the original survey in 1813, and so come to a conclusion as to the present condition of the river; but so can we. At all events, Mr. Rendel himself admits that he has not seen the river for three years, and he says that up to that time there was no injury effected in the river, and although he afterwards goes into some calculation, partly based upon Mr. Calver and partly upon Mr. Comrie, as to certain tidal abstractions, or a certain amount of cubical yards of water less in the river, I am not now going to trouble the Commissioners with any laboured argument upon these calculations, on the process by which Mr. Rendel came to this conclusion, nor need I pause to expose his errors, for the data from which he speaks are equally before the Commissioners, and it will be for them to say upon the whole whether the views entertained by us, as to the improvement in the navigable channel of the river and the general condition of the stream are or not supported by a comparison of these surveys. But I must say that it appears to me that if Mr. Rendel had carefully examined the river, that if he had gone down and visited it, so as to be able to speak practically from his own observation, and as the Chairman put it, "from what he "saw with his own eyes," he would have been an infinitely more important witness either for or against, than he appears to be upon his own confession. Sir, there is one important fact you must not lose sight of, that since then the works have been going on. Mr. Rendel, who is so much in favour of half-tide walls, might even have had an opportunity of seeing some half-tide walls constructed by the present Commissioners; and it appears to me that instead of suggesting experiments, if he had wished to enter into a question of practical results, we might have had some evidence from him as to whether or not those half-tide walls, which have been erected during the period of the present Commission, had tended to improve the condition of that stream, and whether or not they supported his theory of half-tide walls causing no tidal abstraction.

Sir, you will remember that upon this part of the case Mr. Rendel pointed out certain spots where he thought the river had degenerated. He was asked whether, comparing the surveys of Mr. Comrie with the previous survey in 1849, there had not been an improvement at the Droitwich and at the Insand. I do not think I mis-state the result of his evidence when I say that he said, taking the place which I pointed out, that there was an improvement, but he added two facts as militating against Mr. Brooks, both of which appear to me, looking to the rest of the evidence which we have before us, to be facts in favour of Mr. Brooks, and of his treatment of the river. He first said, "I find that "the Droitwich and the Insand are moving further down the river." Now, Sir, I do not see how the moving of these sands down the river justifies a conclusion unfavourable to our views, because the desideratum will be to dislodge such sands, to get them down the river, and out of the river altogether, and if they are in a course of transition by the operation of the tidal stream carrying them away, it does appear to me that as far as that fact goes it is a fact in our favour, admitting it to be correct. It shows that they are in a moving condition, and I hope they will keep moving till they disappear. But the other fact, which appears to me to be of more importance to comment upon, is this.

Mr. Seymour.

7th March 1855.

Mr. Rendel having admitted, when I say "admitted" I do not use any invidious term, but having in answer to my question said that my view was correct upon that, and that there was an improvement at the particular position to which I referred in the navigable channel, he pointed to a part a little lower down the stream, and said that there was an accumulation near the Droitwich Sand and the Insand, and he left the impression, and no doubt entertains the opinion, that that accumulation was a proof that the river had not improved, but that the result had been an injury to the navigable condition of the river. Sir, when Mr. Robert Stephenson was called as a witness before you, I drew his attention to those places which had been pointed out by Mr. Rendel, and it was then stated by Mr. Stephenson, that those accumulations occupied the site and bed of what had been originally full-tide swashways, where there had been a useless wasting of tidal water, which these accumulations had filled up; that a deeper channel was gained in the river, and that therefore he considered these accumulations rather as marks of an improvement in the navigable condition of the river than of a retrograde tendency. It appears to me therefore, Sir, so far as Mr. Rendel's evidence goes, as to the accumulations either at the Droitwich or at the Insand, taking it in the light of Mr. Robert Stephenson's evidence afterwards, and taking it also with the fact that we have no corroborative proof to show that Mr. Rendel's view was correct, as to any sensible injury to the navigable channel, we may safely conclude that the river has improved, and Mr. Brooks may take heart when he finds that what one engineer thinks theoretically an injury, another engineer declares to be practically a benefit.

Well, Sir, there is another piece of evidence given by Mr. Rendel, which I confess sounded to me, from my not very lengthened acquaintance with the Tyne, but still from some observations as to the trade carried on upon that river, and from some knowledge of its commercial condition, somewhat extraordinary. The question was, "In the Tyne is "the sailing channel or the facility of vessels getting up, of importance, independent of "steam?—No doubt about it; it is of very great importance; the coal trade cannot pay "the expense of steam tugs." Well, Sir, I confess I was startled by such an opinion. It is not an engineering matter, fortunately, but one upon which I might form a conclusion of my own, and it appeared to me that this was a very strange assertion. And Mr. Rendel, upon being pressed afterwards by me on cross-examination, adheres to his opinion, and does not at all qualify or alter it. Well, I asked Mr. Walker, and I asked Mr. Robert Stephenson, who has a long and intimate acquaintance with that river, as to whether or not the coal trade not only could pay the expense of steam tugs, but whether steam tugs are not almost invariably employed for the assistance of colliers up or down the river. The answer I got was that which I should have expected, and which proves that Mr. Rendel on this part of the case also had formed an erroneous impression. All I can say is, I don't know where the coal traffic of the Tyne would be, if the coal owners were not to employ steam tugs. If they paused to enter into the consideration as to the expense of employing them, they would find that they would save more in the employment of a steam tug, in being able to take advantage of a single tide, than they would necessarily expend in the detention and the loss which would otherwise accrue to their trade, or even in the very victualling of their ships for the time that they would have to lie by waiting for a tide. Mr. Walker's more practical experience, and the evidence of Mr. Robert Stephenson, which is still more valuable from his larger acquaintance with the river, presents a remarkable contrast to this extraordinary conclusion which over Mr. Rendel has formed. Fact once more triumphs opinion.

Sir, this is another instance in which Mr. Rendel seems to me to have formed an impression and drawn a conclusion scarcely justified by the grounds which he afterwards stated in cross-examination, as those upon which he came to that conclusion.

Sir, another observation of Mr. Rendel's, which seems to me equally startling, is this. He says, "I took three years to consider what I would say," that is in his report. It appears that Mr. Rendel considers that three years is a very short space of time, indeed, for an engineer to devote to his lucubrations before he puts his name to a report upon river works. He says, "I took three years to consider what I would say as to it most "deliberately. I knew the importance of the Tyne, and I felt that fifty years hence, "those who meddled with the Tyne would have a good name or a bad one for engineering. "I give them fifty years—fifty years is a small time to prove the worth of these things." All I can say is, that if we must wait for fifty years before we can come to a conclusion as to whether Mr. Rendel is right, or Mr. Robert Stephenson is right, I hope we may be all alive when that time arrives, but in the ordinary calculation of human life, such a blessing may not occur to us at all. But if it will take half a century to settle the question between full-tide and half-tide walls, what will become of all the rivers in England? At all events, one thing is quite clear, that if Mr. Rendel thinks it is necessary to take fifty years before the river works are properly tried, and if, as he says in another place, five years is altogether too small a time to come to a conclusion, probably that may account for any alterations of opinion which he has given, and probably account for any difference between the report of 1851 and the period of his own limitation in 1855, when he gives his evidence here. But I think the opinion of Mr. Rendel upon this point shows, that if that be the correct view which he takes of the matter, he can scarcely have formed his own conclusion yet, with regard to the relative merits of full-tide or half-tide

Mr. Seymour.

7th March 1855.

walls, upon a basis which can be satisfactory to himself. He must according to himself, be still quite an infant in river engineering.

Well, Sir, Mr. Rendel then referred to the subject of piers. I think a great many observations may be spared by me with reference to this evidence of Mr. Rendel, because it must occur to anyone at the outset, that Mr. Rendel entertains a very strong view, and a very strong opinion of his own in favour of a certain plan of piers. That plan was before Mr. Walker, and Mr. Walker pays a deserved compliment to the ability displayed by Mr. Rendel and the other gentlemen whose opinions were taken into consideration by him. But Mr. Walker did not adopt that plan, and therefore we must to a certain degree take Mr. Rendel's evidence 'cum grano salis.' They are the views of a gentleman given with reference to a plan for piers, adopted by another gentleman in preference to his own, and sanctioned moreover by the Admiralty. The old logical formula teaches that "all "men are fallible," and we do not require Aristotle to guide us in concluding that Mr. Rendel may be biassed where his own credit is at stake.

Now, Sir, I find that Mr. Rendel in his report on referring to the objects which would be effected by the entrance piers proposed by him, says, first, with regard to the south pier, "The south pier, projecting as it does east of Freestone Point and of the north "pier head, will catch the flood tide stream as it comes down from the north, and send "it into Shields harbour in a direct course." Then he says, "It will prevent the wheel "and the other cross currents due to the flood tide overrunning the harbour's mouth, and "it will shelter the whole of the channel, from the bar to the Narrows, from the south-"easterly gales." Now, with regard to those last two objects which will be effected by Mr. Rendel's piers, it appears to me that the shelter effected in the channel from the south-easterly gales, and the prevention of the wheel and the other cross currents, are common to both schemes, either that of Mr. Walker or that of Mr. Rendel. In fact, they are, if I may so speak, more in favour of the object, and provided for more securely by the principle or the plan of Mr. Walker than by that of Mr. Rendel. But at all events, those two which he mentions as prominent features of his own plan for the south pier seem to me to be equally applicable to the pier proposed by Mr. Walker; he says, "It "will catch the flood-tide stream as it comes from the north." A great deal has been said about the importance of catching the sea current as it crosses the mouth of the harbour, and carrying its momentum up the river. Sir, there is one thing that we must recollect, that whatever may be the benefit of catching the cross current, assuming that to be practicable, or that it would result from Mr. Rendel's piers, we must see whether we do not also catch the sea along with it, because it is one thing to catch the tidal volume, and it is another by the mode of catching it to propagate seas up the mouth of the harbour where the shipping is lying. Now, according to Mr. Rendel's plan, we have what I believe in engineering terms is called "a kant," 1,200 feet long, but if this kant "propagates," to use his own expression, the momentum from the ocean, must it not also tend to propagate the sea or the wave as distinguished from the tidal current up to Shields harbour? Is not this, instead of being a benefit, a danger? and in place of being an illustration of the good of such a plan, rather an illustration of the evil which might possibly flow from it?

But one word with regard to "catching" the flood-tide stream. I think evidence has been given that the velocity of the tidal column as it passes from north to south is a mile an hour at the strength of the flood; and I think Mr. Robert Stephenson admitted that fact; and Mr. Walker admitting that fact said, that although he admitted it as an element, scientifically speaking, of calculation, yet he considered it to be so slight and so trivial as compared with the other view, namely, with the question of the effect of the pressure of the ocean wave upon the column, that it was not worth taking into the calculation. Mr. Robert Stephenson treated the matter thus; he said, it is a mechanical question. The tidal column outside had been raised to an elevation above, if I may so speak, the tidal reservoir within; that mechanical influence, therefore, propagating itself up the river. Mr. Walker seems to have come to the same conclusion, and justifies the view he has taken.

But, Sir, there is a witness whom I should like to call, or rather cite, before you, although his evidence has been commented upon by me before in a manner which I think I was justified in, from the mode in which he gave that somewhat hostile evidence, and his too transparent partiality; but certainly, in this instance, I must pray the opinions of Mr. Calver in our aid, because he expresses himself upon this point in a way which completely answers Mr. Rendel, and I think these two opposing forces will completely neutralize each other.

(*Mr. Webster.*) What are you going to refer to?

(*Mr. Seymour.*) Mr. Calver's book on the Improvement of Tidal Rivers, page 96. I think this passage will be an answer to the observations of Mr. Rendel as to the effect of catching the cross current. "No pier or piers can be proposed as an universal panacea; "for unlike the improvement of the bed of a tidal river, where one system is applicable, "and nearly in the same degree in all cases, each outlet must be treated per se as they "have sufficient variety, both in the obstructions to be overcome, and the natural power "for accomplishing it, to constitute each a distinct example. The following precautionary "remarks, however, naturally suggest themselves. Piers are only to be projected for one

Mr. Seymour.

7th March 1855.

" of two reasons, or for both, as the case may be, either to afford internal protection, or " to prevent a wastage of power. It is useless to project piers at the mouth of a tidal " river with a view of getting beyond the bar; wherever the outer ends of such works " are placed, the bar will still be found in front of them. The intention, therefore, can " only arise from the want of a due regard to the cause of the existence of the feature." So far as it goes, no doubt Mr. Calver, upon that particular point, is in favour of Mr. Rendel; but I thought it fair not to pass over that passage, "Piers are not to be " protruded like stop-waters across the coast current as a means of adding to the tidal " quantity."

Now, Sir, I think I am justified in coming to the conclusion, that the " catching of " the cross current " is making the pier what Mr. Calver calls " a stop-water." " We have " already stated under the head of 'Theories,' that the reason of a tide entering a " river is owing to the demand of the latter as a receiver upon the source of supply; or, " in other words, because the level of the river is below that of the sea; therefore, unless " piers increase this difference, they do nothing towards increasing the quantity admitted. " That they cannot do this is palpable; for the effect to be produced by the projection of " any possible obstruction in the way of causing the passing water to " heap up " against " it, would in practice amount to nothing. For example, if the abrupt protrusion of the " sea margin of the North Riding of Yorkshire beyond the general line of the coast north " of it only causes the high water level to gorge up eight inches, what effect is to be pro- " duced by the length of a pier? more especially as in nine cases out of ten a similar action " upon it is prevented by outflanking points." Now, Sir, compare that south pier, with its 1,200 feet kant of Mr. Rendel, with this protrusion of the sea margin of the North Riding of Yorkshire, to which Mr. Calver attributes so little influence; compare the homeopathic dose (if I may use my learned friend's favourite expression) which Mr. Rendel applies, and which he is so fond of applying to these coast currents, with the projecting headland to which Mr. Calver refers; and if the argument of Mr. Calver applies in the one case, it is more than justified in the other. " Piers, strictly speaking, have no " necessary connexion with any river system; that is, while they ensure the proper " direction of the natural power possessed by the river, they do nothing towards its " maintenance; they confine and direct the current, but it depends upon the system of " treatment pursued within as to what amount of current is to be thus directed. To " make our meaning more clear, the sea affords a standard rate of rise and fall, which is " not affected by inferior works. It regulates the time of the passage of the tidal water " due to the river in and out over the bar; therefore, the greater the amount to be passed " in the interval between high and low water the stronger the current, and the less the " quantity the weaker the current, and the scourage also." Well, Sir, it appears to me that I am not using any exercise of ingenuity, but a plain exercise of common sense, if I say that these views of Mr. Calver——

(*Mr. Webster.*) Read the next sentence.

(*Mr. Seymour.*) You can read it presently, if it helps your case, or if you like me to read another three or four pages, I will do so; but I think I am entitled to pray these observations in aid of the particular view I have endeavoured to impress upon the Commissioners. My learned friend tells me to read on. I have read already a portion of Mr. Calver's book which made against myself, in which he differs from the view we entertain, and if I read on possibly I might do so again; but I only need his testimony so far as I have read upon the particular matter for which I use it, namely, in answer to Mr. Rendel's view of catching, as he calls it, the cross current. I say it is making the south pier act as a stop-water upon the same principle that Mr. Calver speaks of in that passage to which I have just referred. Mr. Rendel justified that view very much by a reference to the effect of the Tynemouth headland in diverting, or rather altering, the natural current or tendency of the flood tide from north to south. But, Sir, Mr. Rendel entirely overlooked one thing, of which a glance at the map will satisfy you, I think, which is this, these tidal lines which are laid down upon the map of Mr. Walker will illustrate what I mean. Mr. Rendel speaks of the influence of the Tynemouth headland in altering the flow or the direction of the tidal current, and the importance of having a south pier which would catch that current and direct it up the stream. But Mr. Rendel did not refer to another controlling influence, a higher one and more north than that of Tynemouth headland, extending more out. I mean Sharpness Point, to which Mr. Brooks refers at considerable length in the reports to which I have directed the attention of the Commissioners; but I think a glance at the map of Mr. Walker will show that the real diversion or alteration of the natural tidal line is caused by Sharpness Point and the rocks beyond it, and is not due, as Mr. Rendel says, to Tynemouth Headland. If I am right, it appears to me to do away with one of the grounds upon which Mr. Rendel insists. Now, Sir, if I understand the principle of Mr. Walker's piers, it is this,—he proposes that immediately inside the south pier, as laid down upon this map, there shall be a sort of basin, if I may so speak, in which the waves coming in, or the seas coming in, at the mouth of the harbour, may break themselves, or expend their primary force; or that a ship in endeavouring to bear round the northern pier, if she is forced to beach, may beach without danger; that is one of the results which Mr. Walker points out, and indicates in his report as an argument in favour of his particular view. But contrast that (which appears to me to be self-evident) with the effect of making piers such as Mr. Rendel would have.

Mr. Seymour.

7th March 1855.

In place of a sloping beach of sand, upon which, if a vessel does come in contact she does not suffer materially, she would in his case have a solid wall of masonry to encounter, so that if she came in contact with it, the result would be instant destruction. In the one case we have a wave trap, and in the other case we have a wreck trap. In the one case we have that which would be attended with safety and escape for life, and in the other that which would be attended with loss of life and disaster. It appears to me that the comparison of those two plans in that view of the case, will entirely vindicate and support the reasoning and the arguments of Mr. Walker and Mr. Brooks.

But, Sir, Mr. Rendel says that his north pier, as he proposes, will afford greater shelter to the entrance channel from the north-easterly winds, and lessen the amount of broken water immediately within the bar, Now, Sir, I confess that I am at a loss to conceive, and perhaps my learned friend will point it out, how, inasmuch as the head of his pier lies within the present bar, this greater shelter which he speaks of, from north-easterly gales, will be effected. I cannot discover the mode in which Mr. Rendel comes to that conclusion; perhaps my learned friend can point it out to the Commissioners. Well, a north pier is proposed by Mr. Rendel; and when I am commenting upon this, allow me to say, that if he himself has proposed a north pier such as he has proposed, the arguments which he uses in favour of his pier are no doubt so many arguments directed against the pier proposed by Mr. Walker. I am not therefore so much attacking his piers as defending Mr. Walker's. He says he proposes the north pier, "with an opening "behind it." Now, Sir, of two things, one. If a pier is built such as Mr. Rendel proposes, the obvious tendency would seem to be, that behind that opening to which he refers there would be a gradual accumulation of sand, of wreck and silt, and other matters of that kind. If so, what becomes of his "openings"? but perhaps the answer to that will be—no, the ebb tide will get round that way and so prevent that accumulation. Then, Sir, if that be the alternative, in place of the ebb tide and the flood tide being directed in the same channel, and the influence of the ebb brought with its whole body and energy to scour out the bar, we have a portion of that ebb sent over the rocky shore behind the north pier, as proposed by Mr. Rendel; we have that diverted and sent away from its natural tendency, and we lose, therefore, a great portion of the wholesome influence which ought to be brought, according to Mr. Walker, upon the scouring out of the channel of the river. We dissipate the energies of the stream where they should most be concentrated. Then, Sir, I say, either that opening behind will be silted up, or you will get a divergence of the ebb; take which alternative you please, because either is sufficient for me to dispose of Mr. Rendel's engineering scheme as laid down upon the plan.

Well, Sir, another word with regard to the inner piers as proposed by Mr. Rendel. He is strongly in favour of full-tide piers—guiding piers as he called them, or guiding walls, inside the outer piers. I may just in passing observe this, that I cannot for the life of me understand why, if those full-tide guiding walls would be so very useful there, Mr. Rendel should deny them that utility which we say would flow from them elsewhere up the river.

Sir, passing from that observation, I think I am entitled to say this—Mr. Rendel in cross-examination told me that the tendency of the south pier would be to check the wheel; to prevent the silting up of the sand circumscribed by that south pier as pointed out by Mr. Walker in his plan, and to cause the accumulating or heaping up of the deposit within. I would submit to the Commissioners, that as that tendency proceeds, so there will be a gradual formation of natural guiding walls—natural banks guiding the stream within; so that, as they are formed, and in proportion as time goes on, that accumulation would tend to produce that very result which Mr. Rendel contends now will follow from the formation of his inner pier.

Now, Sir, Mr. Rendel said that the "north pier would have no effect in directing the "ebb, and that he looks to the south pier for effecting that object." According to the evidence of engineers before us, according to the direct evidence of Mr. Brooks, and according to the state in which we are told the Herd Sand is in certain conditions of the tide, it seems proved sufficiently in this case, that the tendency of the ebb tide is to turn northwards on getting past the entrance of the harbour, from which it seems obvious that instead of the south pier having an influence in directing the course of the ebb, the north pier would exercise that influence. If that be so, it is another argument in favour of the view taken by Mr. Robert Stephenson and by us, that if any pier is of importance it is the north pier and not the south. Mr. Walker thinks—"If any pier, the north "pier should be extended further than the south;" and Mr. Robert Stephenson says—"If you wish to draw distinctions between piers, it seems to me that the windward pier, "and not the leeward pier, is the important one." Mr. Robert Stephenson speaks as an engineer, but Mr. Walker gives both the engineering and the nautical view, as it affects the harbour as a harbour of refuge and as a commercial harbour. In either view I submit that the arguments are in favour of the extension of the north pier, and that the north pier, in its effect of guiding the current of the ebb, and in sheltering from the north-easterly gales, (which are the most dangerous upon the coast,) both in its general principles, whether nautical or engineering, is a work of greater importance than the south.

Sir, I have now gone through, I think, the whole of Mr. Rendel's evidence; there is,

Mr. Seymour.

7th March 1855.

however, one matter more which is suggested to me by my friend MrClayton, and which, no doubt, I have omitted, which is another instance of the apparent inconsistency of the views entertained by Mr. Rendel. He prescribes a half-tide wall at the Hay Hole Dock, enclosing 58 acres, but he afterwards recommends a full-tide wall on the opposite side of the river enclosing 130 acres. Now, certainly, that is another inconsistency, which I thank my friend for suggesting. It appears to me to strengthen the argument which I have already addressed to the Commissioners as to the apparent alteration of Mr. Rendel's views within the few years gone by as compared with the views which he now entertains.

Well, Sir, I have now nearly disposed of Mr. Rendel, but I confess I think one observation fell from his lips which, considering his previous connexion with the former Conservators of the river, and considering that he was invited to give his opinions here on engineering questions only, and that the observation he made was volunteered, scarcely fell from him with good taste, and that is the following, which in answer to a question which had certainly nothing to do with it, he obtruded upon us. He says—"No party "down there is fit to have charge of the river. I think it is the most extraordinary "thing in the world that here is a river, next to none in consequence, upon which you "cannot agree among yourselves, or find any professional man to agree with you." All I can say is, that Mr. Rendel, as far as his evidence goes, has given us no grounds upon which he bases that conclusion, and as to finding a professional man to agree with us, I think we have found a good many. As to piers, Mr. Walker agrees with us; as to the conduct of our works upon the river, Mr. Robert Stephenson, Mr. Richardson, Sir William Cubitt, and others, entirely agree with us, not to pray in aid the opinion of Mr. Ure and Mr. Taylor, and other engineering witnesses. Then as to the conduct of the Commission, why certainly Mr. Rendel, who had not for three years visited us, is scarcely the witness to say that no party there is capable of managing the river.

Well, Sir, the next evidence that we had was that of Mr. Robert Stephenson, and I shall content myself with rapidly calling your attention to a few important features of that evidence. It is evidence which, from the mode in which it was given, from the circumstances attending Mr. Robert Stephenson's own history in connexion with Newcastle, his personal acquaintance and his local interest, if possible, in the river, and his intimate knowledge of everything affecting it for some years back, seem to me to entitle it to very great weight indeed in the minds of the Commission. He is asked if he has surveyed the Tyne? he says—"I have known the Tyne nearly all my life; I have never "surveyed it. I know it very well." He says—"I have compared the former state "of the river with the changes that have been produced, I believe, by what has been "done by Mr. Brooks, and I think the changes have been evidently beneficial." He says, he has compared Comrie's chart and the surveys and soundings of 1849 with those of 1854, "and having examined those charts very carefully, and compared the "soundings with each other, I am of opinion that a very great improvement has taken "place in the river." Then Sir, he is in favour of full-tide walls; I need not read at length what he says, but I may take the following passages. For instance,—"That "therefore brings me to the question of half-tide walls. Up to half tide the half-tidal "walls would exactly answer the purpose which I have been explaining, that is to say, "the flood tide up to half tide would be retained in as narrow and as straight a channel "as possible; but as soon as ever the tide rose above those walls, then a certain amount "of the momentum, which ought to be confined to the channel would begin to expend "itself in filling the inlets beyond the half-tide walls. Therefore, if my original view "be correct, that is an abstraction of momentum, and consequently it prevents the tide "rising so rapidly or so high as it would do if retained up to high water in one uniform "channel."

He is then asked by the Chairman a question which has been put to many witnesses, and I think if we sum up the answers, they will be found to have an immense preponderance in favour of my clients in this Inquiry. He is asked as to what the effect of the encroachments, as they have been called, has been upon the river, and he says that they have been decidedly beneficial. He is asked by the Chairman, "Have you any improve-"ment to suggest with respect to the management of the river by the Tyne Improvement "Commissioners?" His answer is short but emphatic, "None whatever."

(*Mr. Webster.*) "I never meddled with that question at all".

(*Mr. Seymour.*) Yes; but you remember he subjoined that after, but not as a qualification of what he said before. He is then asked, "Can you give the Commissioners any "opinion with respect to the proposed piers at the entrance to the harbour?—I think I "would rather not give an opinion upon that point. I have not, I think, given it suffi-"cient attention." He goes on to say that he thinks Mr. Rennie did not in his scheme consider, or, perhaps, did not give sufficient importance to the question of ships coming in there under a north-east gale.

Then with regard to the cause of the bar, which he attributes to the damming up of the water by the contraction of the Narrows, I need not read his evidence before the Commissioners, because they will recollect it. He is asked, "Would the immediate effect of "the two piers be that the water would rush in through that which you say is a stric-"ture, and disperse itself over the whole of this area?—Partially it would distribute "itself, but still it would be directed in a straighter line, because if you suppose the sea

Mr. Seymour.

7th March 1855.

" to be suddenly raised up there, and this to be a trough, the line of the moment, if " directed in this direction, would rather improve the channel here." And he speaks of the current being more direct than now; that is, in reference to questions which were put to him by my learned friend, as to the inner piers of Mr. Rendel; he afterwards explains that as the stricture at the mouth between the piers is so much larger than the stricture of the Narrows, that answers the objection entertained as to the influence of that stricture upon the condition of the river.

Then, Sir, here is the passage to which I referred before. He says, " The supposed ad- " vantage to be derived from catching the coast current, I think, is so small that you " must regard the sea there as rising up as a great lake, rising up with scarcely any velo- " city at all. Then it begins to rush into the river; the momentum from that source is " so large as compared with the momentum of the flow of the tide in the sea, that I " think you must regard the tide as principally owing to the rush of water from the sea " into the river. As to the simple rising?—As to the simple rising. Supposing piers of " that sort to be put down, you would view this case when they were down as due to the " simple head of water?—99 out of 100." Therefore, Sir, not to the catching of the coast current, and so propagating its momentum up the river, but to the statical pressure of the flood outside forcing itself up the river, Mr. Robert Stephenson attributes the direction of the tidal volume up the river. Then he speaks of a vessel; he says, " Supposing a vessel " is coming in under sail from a north-east wind in distress, I think you ought to have " the north pier there to the windward; the long pier, I think, ought to be to the wind- " ward;" thereby supporting the view taken by Mr. Walker and Mr. Brooks.

Then Mr. Robert Stephenson refers to a case with which Mr. Rendel stated he was very intimately acquainted—so intimately acquainted, that he said he could find his way about it in the dark. I mean the River Humber, but which appeared from the facts we have got with regard to it, not to be a very strong authority in his particular view as to rivers, where the mouth of the river was at right angles with the coast current. Now, Sir, I would just mention this fact to the Commissioners, as being the result of an examination of the state of the Humber and the course of the tide there.

(*Mr. Webster.*) Does the chart show that?

(*Mr. Seymour.*) Yes. That the course of the tide for 25 miles, from the Humber to Hull, runs from south-east to north-west, the sea current being from north to south. Now the rise of the Humber at Sperm Point is 23 feet, and at Hull, 25 miles above, 22 feet; the duration of the flood tide at Hull is thirty-five minutes, while at Sperm it is almost the same, yet it is a river without a bar. Now I confess it appears to me that the case of the Humber conflicts with Mr. Rendel's theory, and justifies the observation of Mr. Robert Stephenson. He says the Humber is a case like this, because the projection of Sperm Head is on the north side of the mouth of the Humber, and therefore it affords a shelter in the same way. Mr. Robert Stephenson prays in aid the illustration of the Humber as an argument in favour of the view he takes of making the north or windward pier the longer pier of the two.

(*Mr. Webster.*) But the south land projects.

(*Mr. Seymour.*) My learned friend will have an opportunity of exposing any fallacy in my argument. There is also the case of the Aire at Bridgewater, which is in direct opposition to Mr. Rendel's views, and in support of the views of Mr. Robert Stephenson.

Sir, with regard to the commencement of the works, whether at the mouth or up the river, what was the view taken by Mr. Stephenson? Mr. Rendel entertained one view in 1849, altering it in 1855. Mr. Stephenson says, " I think the best way of improving " the bar is to improve the channel of the river from the very top of the tide." I will also put in the river Aire as an example conflicting with Mr. Rendel's view.

(*Mr Webster.*) These maps do not show how they conflict in anything.

(*Mr. Seymour.*) If my learned friend can point out that the Humber does not conflict with his view, I shall be glad to hear it. There are the maps, and he will have a patient hearing presently.

Now, Sir, with regard to the system pursued in the Tyne. My learned friend says in his Bill of Indictment against us, that we have pursued no system. Mr. Robert Stephenson is pressed upon that point, and he is asked the following question. " Would you not " think the proper system of proceeding to be, to have some settled plan as regards the " system of improvement, and then to follow it out to the extent of your means?—Yes, " that I understand is what is going on now in the Tyne." By my learned friend, " From whom have you understood that?—I have understood for years that they were " adopting the plan of jetties, with the intention afterwards of putting in longitudinal " walls. I should be glad to know from whom you understood that there was any " uniform system of this sort going on?—I have seen it myself, and I thought that it " was uniform; there may be some little local differences, but I am not aware of them. " I know the principle adopted by Mr. Brooks to be that of jetties to begin with, and " ultimately longitudinal walls." Now, Sir, as to the absence of system, if the opinion of Mr. Robert Stephenson be worth anything, it appears to me that the expression of his opinion there is as strong as language can be in favour of the conclusion that Mr. Brooks' operations upon the river have been executed upon a uniform system.

Then, with regard to the accumulations on the Droitwich Sand, and the Insand, Mr. Stephenson says, " There is an accumulation, no doubt, at the Droitwich Sands, and I

Mr. Seymour.

7th March 1855.

" conceive that inasmuch as it closes up the swashway, which a portion of the tide went " over, in proportion as it silts up, it turns more water into the main channel of the " river, and consequently, in my opinion, improves it." That, as I have before stated, was the part of the river to which Mr. Rendel referred as an injury to the navigation ; if it was not, let my learned friend point out the part to which Mr. Rendel's attention was directed, and which justifies the statement made. Mr. Robert Stephenson's attention was called to those spots, there can be no mistake about it, or my learned friend would have corrected it at the time. And Mr. Robert Stephenson says that that accumulation which Mr. Rendel thinks an injury, he considers a positive benefit.

Then with regard to the question of catching the coast current, of which Mr. Rendel spoke so much, Mr .Stephenson, besides the passage I have read before, gives the following summary of his evidence :—" I adhere to the answer I gave before. I stated then " that I thought that the momentum or the impulse derivable from the tidal current " along the ocean from north to south was not great, as compared with the impulse which " the tide going into the river receives from the lift of the ocean." Then he goes into a general explanation of the reasons for that view. I think I am justified in passing on without further comment upon the evidence of Mr. Robert Stephenson. It appears to me to be strongly in favour of the views entertained by the majority, and strongly suggestive of the conclusion that we have acted upon a system, and that that system has been wise, has been founded upon sound engineering principles, and attended with the best practical results, namely, the improvement of the navigable channel of the River Tyne.

Now, Sir, the next person whose evidence I have to comment upon, not necessarily at such length, is the evidence of Mr. Walker. Mr. Walker guards himself several times against giving a positive opinion as to the condition of the river. He begins his evidence, I think, by saying that he was never asked his opinion professionally with regard to the river, and he ends his evidence by saying, with regard to the condition of the river " I am an ignoramus ; I was never consulted about it." I believe that was the last answer he gave. No doubt, Sir, what Mr. Walker meant was, that although he had a general opinion upon the river as an engineer and a gentleman of observation, yet he would not like to be examined in details or minute calculations upon the matter, inasmuch as he had not professionally employed his time in investigating its condition ; but taking his evidence upon the subject, what does it amount to ? He is asked, " I appre- " hend that you went down the river, and had an opportunity, as a professional man, of " seeing more or less what the state of the river was, and under what course of improve- " ment it appeared to you to be ?—The answer which I can give to that question must " be given generally. I believe that it is improving." " Improving." It is in the present tense. He speaks of it as improving at the time he gave his evidence, that is the conclusion which he formed. He has not directed our attention to any minute grounds upon which he came to that conclusion. He has guarded himself against doing so by saying he has not been professionally employed ; at all events, he gives us the benefit of the conclusion he formed that the river is improving.

Mr. Walker says a great deal, in the course of his evidence, with regard to Jarrow Slake. Now I think I may spare myself the trouble of replying to many of the opinions expressed by Mr. Walker, or much of the evidence he gave upon that subject. A portion of Jarrow Slake is authorized to be enclosed, by what authority ? By Act of Parliament. I think the view of the Commissioners before with regard to that was that we were not sitting in judgment upon the acts of the Legislature, and so far I might pray this in aid, if necessary, in answer to that part of the case. With regard to the rest of the Slake, there is no evidence of any intention to close it up, that I am aware of, so that I might content myself with that answer to Mr. Walker. But, Sir, in addition to this, after the evidence which has been given upon this matter, both by our witnesses and by the various witnesses who have been called before you, I confess I feel that there is nothing in the evidence of Mr. Walker which has not been either explained or answered by the evidence given by Mr. Robert Stephenson, Mr. Taylor, Mr. Brooks, and the other engineering witnesses who have given their evidence in favour of the views entertained by the majority in this Commission.

There is one fact which Mr. Walker states, namely, that the whole of Jarrow Slake passes off to sea before the half ebb. In that he adopts the fallacy which misled Mr. Rennie, and the fallacy which misled Mr. Giles in coming to that conclusion. The fact is proved before us ; my learned friend can dispute it if he pleases, but the fact is, as proved, that Jarrow Slake is nearly emptied, and that a considerable part is nearly dry when it is half ebb at the bar. If that be so, it is quite clear that the conclusion upon which Mr. Walker bases his opinion is not a correct one. Mr. Walker seems to attribute the influence of Jarrow Slake, and to have been led to come to the conclusion he has expressed with regard to the beneficial influence of Jarrow Slake, from observing the increased rapidity of the water flowing towards Shields harbour from the Narrows ; and he seems to have fallen into the common logical fallacy " post hoc ergo propter hoc." There is no doubt of the two facts ; but there is very great doubt whether the one fact accounts for the other. There is no doubt the water goes fast, but why does it go fast ? According to the view entertained by Mr. Robert Stephenson, Mr. Brooks, and the other gentlemen who have given evidence here, it is upon the same principle that the waters of a river when they meet with the arch of a bridge gather energy from the partial opposi-

Mr. Seymour.

7th March 1855.

tion, force through, and precipitate themselves in a cataract; there is a contraction, the water heaps up; therefore, when it effects a passage it goes with greater rapidity. Although the two facts, therefore, may be contemporaneous, I do think the phenomenon which Mr. Walker has observed, that rapidity of the flow of the current, instead of being attributable to the influence of Jarrow Slake, is due to another cause. The Commissioners will remember the observations of Mr. Rennie in the commencement of his report, that great depth and great width are incompatible with each other, an observation which, I think, is the best answer to the views Mr. Walker entertains upon that matter; and also, they will recollect the law of hydro-dynamics, that velocity and depth are diminished in proportion to the width of the channel. If that problem be correct, it seems, as a matter of principle, that the view entertained by Mr. Walker of the beneficial influence of Jarrow Slake and similar excrescences upon the navigable channel of the river is incorrect.

Sir, I would content myself by referring here to the opinion of a gentleman whose name has been mentioned in the course of this investigation, and who expresses himself with remarkable ability and clearness upon the condition of the Tyne. I refer to Mr. Macgregor's work, entitled "Observations on the River Tyne with a view to the "Improvement of its Navigation." The work has only been placed in my hands since I was last here, but I confess there is a union of scientific ability with a power of lucid expression which appears to me to make his reasoning extremely clear to understand and agreeable to peruse. I will dispose of Mr. Walker's views upon this matter by placing them in juxta-position with Mr. Macgregor's. The latter gentleman thus expresses himself at page 51:—"If the velocity be in this manner sufficiently increased, the "regimen will be destroyed, and the river will dig its own bed. It is this energy of "deep waters which preserves the velocity of streams, notwithstanding the slope of their "beds diminishes as they recede from their sources, and enables them to convey their "vast burden of detritus to the sea, which otherwise would choke up their channels, and "be dispersed over the neighbouring lands. It is this salutary property, therefore, which "it is so desirable to communicate in due degree to the waters of the Tyne; but as there "are no neighbouring streams whose aid we can command for this purpose, we must "endeavour to gain the advantage by introducing a greater quantity of water from the "sea; and in no other way can this be effected than by cutting off the inlets and con-"tracting the wider spaces of the channel, where much of the water of flood tides is "wasted, and consequently the velocity and hydraulic mean depth diminishes." He then uses the following language:—"It is obvious that, as the tide in a river is merely the "propagation of the great tide wave of the ocean, the only cause of its ascension is the "vis a tergo or force from without, and that all within its opposition, the current of fresh "water, the slope, the elbows; and that there is no inherent property of attraction in "any inlet, as the term in-draught implies. The tide spreads over Jarrow Slake in virtue "of the law of gravity, which compels water to preserve its surface level. When it has "risen in the river above the level of this inlet, it declines in that direction to satisfy this "law, but the rate at which the deflected waters move is so slow, that at spring tides two "hours and three quarters elapse before it is filled to the average height of four and a "half feet. The velocity of their motion is that which is due to the smallest slope on which "water will flow merely from its own weight, which is about $\frac{1}{16}$th of an inch per mile, "which produces a motion nearly insensible. Major Rennie informs us, that during wet "seasons the current of the Ganges is from five to seven miles per hour, with a slope of "four inches in the mile, while the current of the waters draining from the inundated "lands is only half a mile per hour, with a much greated descent. While Jarrow Slake "is filling half the water of a tide is poured into the river, which, in the range of 16 miles, "must be twenty times more than what enters this Slake. The rate of the stream in the "river, therefore, must be at least twenty times greater than in the Slake. Jarrow Slake, "therefore, instead of encouraging or increasing the rate of flood tide, diminishes the "velocity of the stream immediately above it, and in the same ratio the quantity of water "which would otherwise pass upwards or is due to the primary velocity. So far, at "present, we find it detrimental to the navigation, and, by parity of reasoning, every "other enlargement beyond the mean width of the channel, for their analogous effects "take place, however insensible to us, because the principle is of universal operation." Then one passage more: "But reducing the channel, therefore, to a mean width, we shall "gain an additional quantity of water from the sea equal to all that is now wasted in "Jarrow Slake and other inlets, and to what may be due to the new velocity. This "measure will also be effectual in raising the perpendicular height by the regularity with "which it will enable the tidal wave to oppose the descending stream; and for the same "reason the scouring functions will be improved by the equal distribution of the ebbing "waters over the bed. When a flood tide comes to the mouth of a river it checks the "current of its waters, and they accumulate there. This checks the current farther up, "and they accumulate there also; and this check of the stream, and consequent rising of "the waters, is gradually communicated up the river to a greater distance. The water "rises everywhere, though its surface still has a slope. In the meantime, the flood tide at "the mouth of the river passes by and an ebb succeeds. This must accelerate even the "ordinary course of the river. It will more remarkably accelerate the river now raised "above its ordinary level, because the declivity at its mouth will be so much greater; "therefore the waters near the mouth, by accelerating, will sink in their channel and

Mr. Seymour.

7th March 1855.

" increase the declivity of the river beyond them. This will accelerate the waters beyond " them; and thus a stream more rapid than ordinary will be produced along the whole " river as far as the tide reaches, and the waters will sink below their ordinary level. " Thus, there will be an ebb below the ordinary surface, as well as a flood above it, how- " ever sloping that surface may be. But if the channel be not of regular breadth, this " ponding back of the fresh water will not by any means be so great, because the dilata- " tions tend to neutralize this effect." Now the dilatations to which he refers he illustrates by the example of Jarrow Slake; and I think the views which are so clearly expressed by Mr. Macgregor define better than I can the views entertained by Mr. Brooks, and in the light of which the majority of this Commission have carried forward their works upon the Tyne.

With regard to Mr. Walker, and to his evidence with reference to Jarrow Slake, I would just observe that in his report upon the Welland, the principle he has recommended there is quite in analogy to the principle adopted by Mr. Brooks in the Tyne. He there does not recommend any reserving of those bulbs or excrescences from the natural bed of the river, and there also he makes full-tide walls, as he admitted upon cross-examination.

(*Mr. Webster.*) Not the Welland; I know the Welland perfectly well, there are no half-tide walls there; there are no walls at all, it is faggots; the Welland is a most successful instance of training the channel with faggots.

(*Mr. Seymour.*) I don't care whether they are walls or faggots; if they are above the half-tide level, the argument in my favour is just the same; but I referred to the Welland as an instance in which Mr. Walker does not exhibit the same nervous alarm about the making of land, and therefore, so far opposed to his view with regard to the injurious consequences to the Tyne of closing up Jarrow Slake. I believe in that report on the Welland, he says there were something like 5,000 acres of land to be gained by training the river with proper banks.

(*Mr. Webster.*) No doubt it was a most successful land-reclaiming scheme, and there are the same operations on the Tyne also.

(*Mr. Seymour.*) My learned friend takes his view of the matter, and I take mine. I merely pray in aid the Welland, as an illustration of the mode pursued by Mr. Walker there; at all events, whatever the benefits of the land recovered may be, he has used faggots to a full-tide height, and he has enclosed to the extent of some 4,000 or 5,000 acres without damaging, but attended with the results of very much improving the navigation of that river, and he left no Jarrow Slakes.

Now, Sir, I shall make one quotation from the evidence upon the Jarrow Dock Bill which is before you, and that because it expresses so clearly the views which I have been urging upon the Commission with reference to this Jarrow Slake. I mean the evidence of Mr. Harrison, who was examined upon the Jarrow Dock Bill. " Then, in your opinion, is " the best thing that could be done, so far as regards the economy of the river itself, to con- " struct the wall across Jarrow Slake in the way in which it is proposed to be done?— " That is the opinion which, after a good deal of consideration of the subject, I have " arrived at. I can hardly conceive that if an engineer were going to design a river, he " would design a river with a series of Jarrow Slakes upon it. I cannot conceive if he " had the sole liberty to do as he liked with it, and of course he would not put half a " dozen or a dozen, why he should put one; if it were so, I have no doubt that the tide " would not flow at Newcastle Quay." There appears to me to be a fallacy in the views entertained by Mr. Walker, and those who agree with him, because if Jarrow Slake be so beneficial, why not have half a dozen of them? If one be so beneficial in its effects, why not repeat the dose and give us more of them? " If you had many Jarrow Slakes " in the Tyne, the tide would not get to Newcastle Quay?—No. Will the effect of " this be to increase the capacity of the river itself for tidal water?—I believe that it " would be so. I maintain that the more legitimate reservoir for the tidal water is the " bed of the river, and that by deepening the bed of the river, as such works would " undoubtedly do, you will get what is the legitimate reservoir for it." Now, Mr. Walker uses the emphatic expression, " I beg and pray the Commission to do nothing that will " lessen or diminish the void to receive the ocean water in the Tyne." We contend that we are not doing so; we are only making, in place of such voids as Jarrow Slake, more legitimate voids in the natural bed of the river; we endeavour to gain by deepening the reservoir of the river itself that which is, according to Mr. Walker, lost by the closing up of Jarrow Slake.

Well, Sir, so far with regard to the general opinions of Mr. Walker upon the condition of the Tyne; he points to the circumstance of Jarrow Slake as the great ground upon which he disapproves of the engineering principles upon that river. Notwithstanding that, and notwithstanding the other matters to which he refers, his views with regard to half-tide or full-tide training walls begin and end with the admission that the river, as a whole, is improving. Now, Sir, with regard to Mr. Walker's piers, I shall not dwell at any length upon them; his plan is before you, and the reasons for his plan are before you; he states his reasons in an engineering view, and in a nautical view; he tells you how far those plans are superior to other plans upon engineering principles, and he points out how the fact of shelter to ships, and enabling steam-tugs to get out to bring ships in, and in other respects how as a nautical question, and viewing it as a harbour of refuge, his piers are superior to the others which are before you; he

Mr. Seymour.

7th March 1855.

also adds, and I think that is a matter to which I ought to refer, that the plan which nearest approaches to his own, and which he adopted upon his own engineering responsibility, was the plan of Mr. Brooks. Therefore we have this fact; the engineer of the river, having his own character at stake in the improvement of the navigation of that river, lays before Mr. Walker the plan of piers which Mr. Walker, acting upon his own engineering responsibility, adopts in preference to any other; a consideration, I submit, of the highest importance.

The Commissioners have saved me from many observations which I should have made with reference to the plan of Mr. Walker. My learned friend endeavoured, perhaps driven off the strong ground of proof, to take refuge in prejudice; and not being able to make out a case at Newcastle, he thought he would try to make out a case in London, if not against the Commissioners themselves, against my friend Mr. Clayton, but my learned friend's efforts have failed him. I think the conclusion to which the Commissioners will rather come is, that my learned friend felt his case was desperate, when he endeavoured to bring in the correspondence as to matters going on between the Tyne Commissioners, the Admiralty, Mr. Walker, and Mr. Brooks, to affect your minds with respect to the working of this Commission; forgetting, or wishing you to forget, that the proper and only subject of inquiry before you is, as to whether or not the "encroach-"ments" which exist or are proposed upon the Tyne have injured or are calculated to injure the navigable condition of that river. Sir, Mr. Walker summed up all by quoting the emphatic language of Admiral Beaufort, the hydrographer, who said, I think, to use his own words, "If an angel from heaven were to suggest better piers, he might, but "that he himself as hydrographer could not suggest anything superior to Mr. Walker's." That is a strong expression, but it is as flattering as it is figurative, and it shows the opinion entertained with regard to those piers. Upon the whole I think I need not trouble myself any further with the vindication of Mr. Walker's plans. He has been before you, his report is before you too, and it speaks for itself. I only hope time will tell that the piers have been wisely and judiciously planned, and will be effectively carried out, and that when the last stone is laid upon them, it will at least carry out the wish of our chairman, that it will prove the foundation of perpetual peace between the hitherto divided forces in the Tyne Improvement Commission.

Now, Sir, the next witness called before you, or rather who presented himself for examination, was Mr. Macartney, whose evidence literally came to nothing. He was, I believe, chairman of the now defunct Tynemouth Dock and Railway Company, in which he was associated with Captain Linskill. How far any idea of reviving that scheme accounts for the presence of the former gentleman and the zeal of the latter, I need not stop to inquire. He was followed by Mr. Murray. I may very rapidly dispose of Mr. Murray's evidence, because it appears to me that inasmuch as we are here inquiring into what will be the effect of the works upon the river Tyne, and he has been brought forward here as formerly the engineer for the Wear, where no river works have been executed, I think we can hardly look upon the evidence which he has given with reference to the Wear as affecting anything done or proposed upon the Tyne. Mr. Murray mentioned the fact, which no doubt sounded as an extraordinary phenomenon, namely, that several years ago, alluding to some old sections which he produced, the level of high water spring tides was higher than the elevation at present attained. Assuming that to be accurate, whether it was due to the freshes then in the river not being able to get away so well as they do now, or what the cause of it was, is not for me to speculate upon; it is a very nice question of scientific and engineering calculations, but I do not see how it presses upon me, inasmuch as no river works have been proved in the Wear, which could be at all pressed as in analogy one way or the other with regard to the Tyne.

Sir, there is one fact which I ought to notice in referring to the evidence of Mr. Murray. I have seen Collins' chart, which shows upon the face of it that before any piers were built at the mouth of the Wear, there was only 12 feet upon the bar at high-water spring tides, and two feet at low water. Abreast of the engineer's house 11 feet at high water, one foot at low water. Colliers of only 12 feet draught used to load in the roadstead there. What is the state of things at the present day? We have three to four feet through the year, and a rise at spring tides of 18 feet. The conclusion to which I would invite you to come from that is, that the natural contraction at the mouth of the river has not been attended with injury, but improvement to the condition of the navigation and the mouth of the stream. Ships are now loaded in the river which were formerly obliged to load in the roadstead; therefore taking that fact and dismissing the speculation as to the cause of the other, I think it is an argument, so far as it goes, making strongly in favour of the views of Mr. Brooks.

Before I pass from Mr. Murray, I ought to mention that he states that he formerly had gone up and down several times upon the Tyne, and he used to stick upon certain shoals; that latterly he has gone up and down the river, and he considers the river is "much improved;" he mentioned that, not as a matter of scientific engineering, but a matter of practical and personal experience; formerly he stuck upon shoals up the river, but he sticks upon them no longer. Therefore, as far as he gives his opinion, he agrees with Mr. Walker, that the Tyne is improved; he agrees with Mr. Stephenson, who speaks more strongly upon the subject, who says that the Tyne is improved; and the only person he does not agree with is Mr. Rendel; but we have the fact that Mr. Rendel only

Mr. Seymour.

7th March 1855.

speaks from calculations, which we can form no opinion upon; he does not bring to the question the recent observations of either Mr. Robert Stephenson, Mr. Walker, or Mr. Murray.

I shall not trouble the Commissioners now with any further observations upon any other witness, nor shall I tread upon what ought to be forbidden ground, considering the understanding upon which I obtained permission to make this address. I think I ought not to refer to the evidence given at Newcastle. I made my observations there upon it, and having done so, and having gone through this additional evidence, I submit, in conclusion, that the bulk and weight of this evidence, taking it as a whole, is strongly in favour of the course we have pursued. Have we adopted any system? Can they point out in this evidence anything which leads to a contrary conclusion? We have positive evidence on the part of Mr. Robert Stephenson, that we have adopted a system; we have no evidence against that on the part of the other witnesses. Is the river improved? Three to one say that the river is improved. We are charged, as Commissioners of the river, more especially with training and improving the navigable condition of that river. Look at the piers. What we say is, that with regard to them, taken in comparison with the others, the weight of evidence is in favour of the piers, not against them. We have, no doubt, theory and speculation arrayed against us, but we have practical experience and sound analogies in favour of the course now adopted both at the mouth of the river and up the river. Upon the whole, if I was entitled to say before that my friend's case had failed, I think I am still more entitled to say so now; if it can possibly be said to have been revived by his efforts to keep it alive, it has again gone back to its former condition. It has suffered a dangerous relapse. I see Mr. Stevenson again. He appears upon the scene here. With the true spirit of a sportsman, he wishes to be "in at the death." I have no doubt that he has come to see the close of this case in a very different temper of mind from that with which he anticipated the opening of this Commission at Newcastle. I hope in the result your report, instead of bringing defeat to us, will bring disappointment to him, and that instead of his gaining a paltry triumph for himself, he will share as one of the body in the increased reputation of the Tyne Improvement Commission.

Sir, my learned friend says in his bill of indictment against us, that the river Tyne has been mismanaged; that the majority are the party who have caused such mismanagement; that the majority have assisted the Corporation of Newcastle, and individuals, in appropriating certain foreshores to which, as Conservators of the river, they should have laid claim; that they have voted such appropriation regardless of the injury to the general navigation; that the majority have opposed the adoption of a general system for the improvement of the navigation of the Tyne. We say on the other hand, that we have pursued the organization of a proper system in the conduct of the several matters placed under our charge; we have prepared plans, and obtained professional opinions to guide us in our operations; we have acted throughout under the advice of an able engineer; we have obtained Acts of Parliament for the construction of piers, for laying down moorings, for the organization of an efficient river police, for the construction of the Hayhole Docks and other works upon the river; we have procured the requisite machinery, employed the most suitable labour, and in person bestowed the most careful superintendence. Finally, we say, as the crowning result of our efforts, the river is improved.

The two cases are before you, Sir; and, as I said before, I hope the conclusion to which the Commissioners will come will be, in the words of the Commission under which they sit, that "the encroachments on the tidal waters of that river by jetties, embankments, and "other works, executed and proposed on the banks thereof, have" *not* "injured the navi- "tion, and will" *not* "counteract the plans for removing the sand banks at the mouth of "the river, or otherwise injure the navigation of that important river."

If I may be permitted, I shall end my speech, and wind up my observations upon this case by repeating the hope expressed by Mr. Macgregor, to whom I referred before as a lucid writer upon the Tyne. He thus concludes his observations upon the condition of the river—"But the great scheme of future advantage cannot be "realized without union of interests; petty jealousy of sister towns must be laid aside, "and their just influence in the confederation heartily acknowledged." He then proceeds to express a hope that "new vigour will be infused into the energies of the people "of South Shields, that manufactories, docks, and warehouses will gradually surround "the Slake." (He evidently anticipates the day when the "Jarrow Chemical Works" will not be its only ornament.) "Whilst" he adds, "the residences of the opulent free- "holders will expand into an elegant city beyond the heights of Westoe, accompanied "with all the institutions and refinements of polished life—North Shields will equally "imbibe the spirit of power and improvement, and ascend accordingly in the scale of "civil importance; while Newcastle reciprocating with both in a community of interest "will head the scheme of local aggrandizement without risk of her pre-eminence as a "provincial capital." All I can say is, may the future bring with it the realization of the hopes of Mr. Macgregor, and may Newcastle and the two Shields, striving ever forward in the path of social and political progress, be gladdened by the same successes, and crowned with a common prosperity!

Adjourned to Saturday next, at 10 o'clock.

Saturday, 10th March 1855.

Mr. Webster.

10th March 1855.

(*Mr. Webster.*) In commencing to reply upon this case, which has now lasted for a considerable time, I really must express my thanks to you, Sir, for the indulgence afforded me in allowing this matter to stand over for a couple of days; for it would really have been impossible then to have gone on satisfactorily with a case of this great importance and length, especially when you remember that the summing up and observations of my learned friend the Recorder of Newcastle upon that very important engineering evidence had been only made that very day. I shall endeavour to show my sense of your indulgence by making my reply as short as I feel I possibly can; and if I should exceed the limit which the learned Recorder of Manchester assigned as sufficient for any speech, I am quite sure he will not have forgotten the time when he might have felt such an indulgence to be of importance to him, notwithstanding the eminence which now distinguishes him at the bar.

Now, Sir, the responsibility which anyone must have felt in the conduct of a case of this kind has been, to a certain extent, increased by the view which my learned friend the Recorder for Newcastle pressed upon you with so much force in his address at Newcastle, where he, in point of fact, substantially insisted that really no case whatever had been made out in support of any of the allegations of the minority. In one sense, so far as regards any personal imputation upon those gentlemen, whom he defended with such great ability and such warmth upon certain occasions, I perfectly agree; it never was any part of the memorials of the minority, or of my instructions, or the intention of anything that fell from me, to make any personal charge against the majority individually. The charge was against the system. The substance of the case which I opened was this, that the present Conservators, in point of fact, were continuing the same system which the preceding Conservators had practised, and which had been condemned by a Committee of the House of Commons in 1849, and by Parliament in 1850, in passing the Conservancy Bill, upon the admission of the Corporation of Newcastle, the then Conservators, who were the persons who promoted that Bill. I might, therefore, pass over, almost without notice, much of the very able speech of my learned friend, but that these proceedings are to be printed, and that it will be due to my clients to afford some explanations of the remarks he has made, though I think really, so far as the merits of this case are concerned I could almost afford to have omitted it.

The deep interest and importance of this Inquiry, I am sure I need not say, are felt by every one of you; for the pains taken and indulgence afforded to get at the truth have been such as to satisfy those who are most deeply interested in it; all will ever feel that justice has been done them in the matter; at all events, that every attempt has been made to get at the truth, to do which must have been your object. The importance of this inquiry has become more and more apparent as the case progressed; for instance, questions which at first, upon the mere terms of the Commission, appeared almost to be wholly foreign to it, have become matters of lengthened inquiry and of vital importance, if you are to apply a remedy to the complaints of the minority. Thus the efficiency of the Commission, and the piers question, which at first sight appeared to be excluded by the language of the Commission, was found to be really included within it, when the bearing of it was disclosed by Mr. Rendel's evidence. It then became immediately apparent, as being a vital question, in connexion with the inner works, and a question which could not be possibly pretermitted without the danger of a miscarriage of your Commission. You will remember, Sir, how strongly that gentleman spoke upon that question, in which he was supported by Mr. Walker, of the connexion of the works at the mouth with the works in the interior. You will remember, Sir, that he said, "That no man who has the smallest "regard for his character for the future, would give evidence upon a question affecting "the improvement of the Tyne, without knowing what were to be the works constructed "at the mouth of the river. I said just now, in the few answers that I gave to questions, "that I refused to report until I had investigated the river as a whole. I take it, that "any engineer who would say that this or that plan was the best for the improvement of "the navigable channel of the Tyne inland, without knowing, and having previously made "up his mind as to what was to be the nature of the piers at its mouth, would be a man who "would have very little regard to his reputation for the future. I am quite sure that it "will be a relief to you, and it will be a very great relief to me, to refer to my report, "instead of giving further evidence, which could only be supposititious, unless I know what "is to be done at the mouth of the river. I will come again if you wish it; but I am "only anxious to save your time, because the first question which I should be obliged to "ask, if required to give an opinion as to whether there should be half-tide or whole-tide "groins or walls as the plan for improving the river, is, what are you going to do at its "mouth? Therefore it would be quite impossible for me to render you that information "which I should desire you to furnish, unless I knew what the plan of entrance is to be. "I am sure that the engineer upon your Commission (Mr. Brunel) will see that any "engineer would think as I do on this point."

Page 290.

I have called your attention to that, for the purpose of showing the correctness of the views which the minority have contended for, that the Tyne, as a Conservancy question,

Mr. Webster.

10th March 1855.

was to be treated as a whole, each part being inseparable, from the very nature of the case, from the other; that the element with which you are dealing here depends upon the admission of the external tidal elevation, and upon its distribution by means of the inner and outer works; that those questions are so inseparably connected together, Mr. Walker told you in his evidence, "the improvements in the lower part of the river are not altogether unconnected with the piers, because I can suppose operations to be carried on in the river which would neutralize very much the good effect which the piers are intended to produce, and will produce if fair play be given to them." Question 4439.

The principle upon which that gentleman went was this very simple principle, that inasmuch as this was to be viewed as a question of external head and tidal elevation, the quantity of tidal water entering depends solely and entirely upon the receptacle to be filled; and he pointed out in very strong terms that it was not only the extent of the receptacle, but it was the position of the receptacle with respect to the distance from the harbour's mouth; it was also the level of the receptacle, because the position of the receptacle which was to receive the water, affected by solid embankments or existing works, is the first and most material question to be inquired into. What will be the effect of such displacement of water in one part of the river and allocating it in another, upon the admission of the water at the harbour's mouth?

Mr. Walker says upon that point, referring to the case of the Clyde, "The way that we have made the Clyde what it is has been done entirely by the dykes and by dredging, getting rid of shoals. If that is to be applied, it may do more good than the abstraction of that particular place may do harm; but Jarrow Slake is a very much more important space than any space much higher up the river is. A great deal has been said about the Narrows, and the quantity of water going through the Narrows, from which it has been inferred that the water which now goes into Jarrow Slake through the Narrows would go up the river. If I am correct in supposing that that opinion has been held, I have no doubt in the world, and I think my friend on the left (Mr. Brunel) will agree with me that it is fallacious. I consider that the quantity of water which goes up is just that which is due to the receptacle or void that is to be filled, and that if you diminish the receptacle, you diminish the velocity, or the depth, or both, of the water passing through the Narrows. If, again, you were to enlarge Jarrow Slake and the river above it, so that the quantity of water, in order to reach high water, should be double what it now is, you would have a greater velocity through the Narrows, which would tend to enlarge that contracted place, and a greater quantity of water would pass through the Narrows to fill the supposed enlarged receptacle. There are many rivers which are very much parallel cases. It is quite evident, I think, that if I were to stop the river water going up by a dam across the river a few miles above the Narrows, the velocity of the water passing through the Narrows would be very small, as it would only have that small space to fill, whereas if the receptacle to be emptied and filled at each time be enlarged, either the velocity or the sectional area throughout the Narrows would be increased." Question 4462. Now, Sir, I do not propose, in quoting that evidence, to refer at all to the once much agitated question about the docks at Jarrow Slake—that is a matter entirely gone by—but I quote it as showing the principle upon which, so far as Mr. Walker's views are concerned, this question of the internal works of the river is to be considered. Following out these views he says, "And, therefore, I trust the Royal Commissioners will not lend their assistance to diminish that receptacle, but by all means to increase it." Question 4538. The system being so inseparably connected as a whole, when that was pointed out to you, it was perfectly obvious that the Royal Commissioners were called upon, in fact, to review the whole Tyne question; and let me remind you that this has never before been a subject of any similar Inquiry. The Inquiry before Captain Washington, and the Inquiries before Parliament, although the latter might have raised the whole question, yet never did so, because it being admitted that there were those defects in the state of the Tyne as regards management, Parliament decided to change the Commission, in the hope that the complaints would cease, and that the necessary remedies would be applied. Those inquiries, therefore, were of a partial nature. No doubt they touched upon almost every one of these questions, but as inquiries and as results they were partial; and it is now, for the first time, that the shipowners more immediately interested in it, the representatives of Shields, and the public, have been enabled to get this matter brought before a competent tribunal, who will review the whole case, and whose recommendations, allow me to say, will unquestionably be carried out by some means or other.

My learned friend the Recorder, as, no doubt, was the interest of his clients, contended for the most narrow possible construction of the terms of the Commission, and he pressed it as a matter of personal imputation of the minority against the majority. A matter of that kind should not prevail in any way within your inquiry, nor will it, Sir; but you will find upon reference to the memorials and to the petition from which this Commission has emanated, that the parties never treated the matter in any other way but as a question of a general system which was to be and ought to be pursued in the Tyne; and I cannot but think that Mr. Stevenson, who gave evidence upon this point, was a little misunderstood by Mr. Brunel, in the way in which he put this and some other of his objections. In answer to question 1476 Mr. Stevenson says, "The mere direction of the lines where they should run was not so difficult a question as the dispute as to the principle upon which they should be made, and the object of those who took our view of the Question 1476.

Mr. Webster.

10th March 1855.

"case was to put an arrest in the meantime upon the system which was going on, of "making full-tide walls, which never could be altered if our ideas should happen to be "correct. We arrested their going on, in order to clear the way for a fair settlement for "whatever system might be most approved," That was the answer which Mr. Stevenson gave in the course of his examination. The question was put by the Chairman to him at my suggestion, in answer to an observation of Mr. Brunel, from which it at first sight appeared as if Mr. Stevenson had been guilty, to some extent, of inconsistency when he said there were no plans produced. Nobody ever denied that Mr. Brooks had plans, or that there were plans; but when the question of plans was talked of, what Mr. Stevenson and what we insisted upon was this, that the only plans that ever were produced, so far as they knew, or that were used, were substantially the same plans as were shown in 1843 and 1845, namely, the plans which accompany the report of Mr. Brooks of that date, showing certain lines upon them which had been at one time or another more or less the subject of discussion; but so far as regards the information which was required by that clause in the Act of Parliament to which reference was made, namely, a plan showing the heights and depths of the quays, the position of the high and low water line, and the soundings, so as to enable a person to ascertain exactly what was required upon any application being made for land; in fact, that kind of information which was the basis of proper conservancy, we have contended, and abundantly proved before you, that nothing of the kind had been done. The only thing which ever existed or that has been made since the new Conservancy came into power was a copy, or probably a copy with slight alterations, of that plan of Mr. Brooks', containing his lines of 1842 or 1845, which, for the purposes of deciding the question of foreshore rights and other rights which to the Conservators were essential, was of no practical avail at all. I therefore think Mr. Stevenson was a little misunderstood, and, I believe, a good deal misrepresented, and, I must say, a little unfairly treated by my learned friend the Recorder in the speech he made at Newcastle. I am sure you must have had ample opportunity of judging of his intelligence and ability in this matter; and I also take the liberty of saying, if the Tyne is now rescued from the state of mismanagement in which we contend it is, it will be more due to the exertions of Mr. Stevenson than of any other individual.

The terms of your Commission, to reply to the observation of my learned friend the Recorder, are not limited in any way, in point of time, as to the case you are to inquire into. Encroachments upon the tidal water, that is one part of the inquiry. "The "works specified are jetties, embankments, and other works, executed and proposed on the "banks of the Tyne, whether they have not injured the navigation, and will not continue "to counteract the plans for removing the sand bank at the mouth of the river, and other-"wise injure the navigation of that important river." Therefore, Sir, in answer to the objection of my learned friend the Recorder, that whatever had been proved was a matter from which his clients personally, the majority, were free, that is an observation which could only have been made upon a mistake of the real objects and the real powers under this Commission. You were to inquire as to those works which had been done, or which are projected to be done, without reference to any question of time; and this would directly involve that which I have already referred to as being the real substantial point of contest, whether, in point of fact, in the language of Mr. Stevenson in his evidence at question 1293, the new Commission, instead of being an independent body, were not still mixed up with the old Conservators, and that, so far as the system was concerned, and as regards the works, it was just as much as anything could be the old system continued all the same as before, as far as river works were concerned. Now, Sir, I say that was a general proposition, which, in the course of my opening address, I insisted upon, because it is impossible in a matter of this kind to draw the dividing line very distinctly. Where you find the Conservators are really the same Corporation, the treasurer the same, the same engineer, the same clerk, and that they have taken to and continued the old works and the old system, whether that be right or wrong, is a matter upon which your opinion must be expressed.

Now, your inquiry being as to encroachments upon the tidal water, it lies almost at the basis of it to consider what was the tidal area at the time which may be considered within the limit of this inquiry, and I refer, of course, to the date of Mr. Rennie's and Mr. Giles' survey in 1813. At that time it appears by Mr. Rennie's reports, and that was verified by observations, that there were about 1694 acres of tidal area. From 1813 to 1849 there were 94 acres abstracted. From 1849 to 1854, to the present time, there have been about something like 34 acres more; that is to say, the encroachments of the same kind as related to the 94 acres which have been going on from Mr. Rennie's time, encroachments of precisely the same kind on the shore, being principally land belonging to the Corporation of Newcastle. I do not refer at the present moment to the Hay Hole docks, the Jarrow docks, or to the Palmer and Leslie's encroachments, which are of a very large amount (something like 270 or 280 acres), as this relates to another part of the case. You will remember in another part of the memorial it was stated by the minority that they estimated the ultimate loss to the tidal area as between 700 and 800 acres. Now, upon calculations and upon an examination of evidence before you, comparing it with Mr. Heppel's most elaborate report, contained in one of the appendices accompanying Mr. Rendel's report, and the sections which there are to which you may refer, you will find that upon a precise calculation the loss in what is called Heppel's second section, namely, from Bill

Mr. Webster.

10th March 1855.

Point to Hebburn Quay is rather more than 50½ acres. That in Heppel's third section from Hebburn Quay to Jarrow Quay it is 232 acres, but at Hay Hole Dock, a portion not included in the other section, it is more than 40 acres. Then Jarrow Slake would be 367 acres, making altogether, as near as can be, 691 acres upon that precise calculation which has been made, and which I suggest is the true one, as a comparison of the quantities; that is to say, an ultimate loss of tidal area of more than 41 per cent., nearly 42 per cent. upon the whole area, as it existed in Mr. Rennie's time, and the substitution in lieu thereof of land or solid embankment of full-tide height.

As to this, the minority have done all they could to bring the matter distinctly before you; we have done, also, as much as we possibly could, as a minority, to get from Mr. Brooks some precise information as to what it was. I do not think, certainly, that ordinary individuals or even a Royal Commission could have done much more to press Mr. Brooks for precise information upon this point. But, Sir, at the present time, we have no precise information from him. We have a certain estimate handed in after the close of the case, subject to certain deductions, of 312 acres in the one case, and in the other 211 acres, upon which I shall have a word to say presently.

Now, Sir, it was also part of the allegation of the minority, that as a matter of fact, whatever the intention had been, the operations had been so conducted as to facilitate as much as possible the making of land. Why, Sir, when Mr. Brooks is called, he avows that such was always the intention. I refer you to the evidence, that I may not be supposed to misrepresent him. I was asking him about some landowners on the south side, whether they had been expecting to get certain portions of land, but were very much disappointed; he says—"Yes, the promise was not kept with them. What promise do you "mean? The promise which was held out by the former Conservators. What was "the nature of that promise? I have stated it already; it was to the effect, that if they "consented to the construction of works on that shore (that was on the Jarrow Quay), to "have the effect of turning the channel into the Hay Hole channel, or to change "Mr. Rennie's plan, then the works should be full-tide works, and they would have the "benefit of that land which was made." Again, in reply to the question as regards Messrs. Brown and Ellison, as to the understanding there was whether they would have the land or not, "It has always been stated by me that my lines were intended to be full-"tide lines, and if they had not been full-tide lines, I am quite satisfied that they would not "have been executed." Then he is referred to what had been done at Willington, and he says—"The works being carried on at the time in the river were all full-tide works, and it "was always stated that they were to be full-tide works. The jetties are all made to the "level of high-water spring tides, and rather above." Then he is asked whether he meant to say that he had a preference for full-tide works; he says,—"That was always "understood."

Questions 20 98–2100.

Questions 212-224.

It will be unnecessary to do more than remind you of the discussions which took place at the meetings of the Commissioners, as to the general effects of the proposed works; as to the nature of those works there can now be no doubt; and, Sir, I will ask you whether the new Conservators, as a body, ever knew, or whether it was ever avowed by them, as a body, so that a minority could deal with it, that the whole of the works that Mr. Brooks ever intended to carry out in the Tyne were to be full-tide works? This Inquiry has had this beneficial effect, if no other, that, at all events, it has placed the minority in a position they were not in before, and has fully justified their suspicions, which, as practical men, and the conclusions which, as practical men, they came to, from what they saw going on, and from what they knew of the interests in connexion with the parties, that the intention always was to construct every work as a full-tide work, so as to exclude as much water as possible, or, in other words, to reclaim as much land as possible for the benefit of persons on the shore, and thereby, as the result, to displace a quantity of water equivalent to the land which was so made.

That I may not be supposed to state this without authority, or to misrepresent the minority, you will remember that even Mr. Rennie's report was quoted by Mr. Brooks and by other witnesses as justifying the alteration, that full-tide works were intended generally by Mr. Rennie, except in particular places. Now I have already referred and may have occasion hereafter to refer to one or two passages in that report, but I think you will be of opinion that such never was his intention. Then the only inference to be drawn from this application to Mr. Rennie's report is this, that when they found themselves pressed with the intention of making these full-tide walls they attempted to pray in aid the authority of Mr. Rennie for that purpose.

In connexion with this subject you will not forget the numerous discussions which took place at the meetings of the Commissioners, and the pertinacious attempts which were made upon the subject of getting the return of the encroachments on the tidal area, and the motions made by Captain Purdo and others of the quantity of land made and making, that is, of the encroachments of the river. You will not forget the way in which the question was ultimately disposed of by Mr. Rayne, who, for certain reasons, was not very desirous of appearing as a witness before you; and you will remember that so far as you yourselves were personally concerned, as early as the 31st of January, and, in fact, before that, Mr. Stevenson, who was then present, pressed this matter again upon the Commissioners, and he said,—"There was also the area of the embankments within his (Mr. Brooks') "proposed lines, which has not been furnished, and which we should like to inspect when

Page 255.

Mr. Webster.
10th March 1855.
pages 301, 302.
Page 305.
Questions 4198, 4209.

" furnished; also a calculation of the quantity of tidal water which would be displaced by " those proposed embankments. These are all very important points bearing directly upon " the subject of the Inquiry, and as soon as they are furnished, if not already furnished, I " think it is proper that we should have some opportunity of seeing them." And then, again, Sir, Mr. Brunel took up the same subject, and the learned Recorder for Manchester also took up the same subject, and I applied to Mr. Brooks "for the area " included within those walls," that is, what would be the existing area of the channel assuming what he called his " lines," whatever they may be, should be carried out; because if we had once got the area we should be able to allocate it, and " also " for the area of encroachments made into solid land, supposing his full-tide walls " were carried out." Then the learned Recorder for Manchester says, " The area of land " which is now at high tides covered with water, and which would then be above high " water-mark." And then I say, " And of course, Sir, the depth, so as to enable us to " calculate it; the abstraction of tidal water is really the thing." " (*Mr. Brunel.*) " The cubical contents?" " (*Chairman.*) That is the more proper word, is it not?" " (*Mr. Webster.*) Yes, Sir, the cubical contents." " (*Mr. Brunel, to Mr Brooks.*) Have " you already calculated that?—No, Sir." It is, I must say, Sir, rather an extraordinary feature in the conduct of the Conservators, that upon so vital a question, which had been known to be a vital question, and so much agitated as the question was by Captain Purdo, agitated to the extent that positively it is made here the ground of complaint against him for his pertinacity, even up to the last adjournment this matter, which had been so brought forward, had never even been attempted to be calculated by Mr. Brooks. Now this pertinacity of the minority was not without good reason, because they believed, and in fact believe at the present moment, that really Mr. Brooks himself knew very little what he was about or what he intended to do; or if he did know what he intended to do, it was not prudent to disclose it because of other interests. You will remember, Sir, I referred you to the report of the Shipowners' Society, which was made as early as 1846, of the proceedings at a special meeting of the River Committee, when Mr. Brooks was asked as to how many acres were included within his projected improvement altogether. The engineer (Mr. Brooks) answers, " I should say not 24 acres from one end of the river to " the other, solid works on both sides." Now, Sir, those were documents and facts which the Conservators had, and which the minority could not fail to contrast with what they knew was going on in the river now, and what they believed it was the intention to continue to carry out. Let me contrast this for a moment with the course which Mr. Rennie took, and which Mr. Rendel took. You have already had your attention sufficiently called upon this point to the great pains which Mr. Rennie took to ascertain the various areas, but I think your attention has not been called to a part of Mr. Rendel's appendix, No. 12. That appendix contains a most elaborate calculation as applicable to this subject, and the principle upon which Mr. Rendel appears to have gone, and which I apprehend any engineer who knew what he was about in treating a subject of this kind would adopt, is laid down in an expression of Mr. Robert Stephenson, which was a very significant one, and which occurs in his evidence, where he is speaking of the natural section of the river, he says, that the way in which the river is to be dealt with, and the narrowing which is to be permitted becomes a question of calculation based upon the original or natural section. Then he is asked, referring to Mr. Rennie's report, the particulars of which he did not remember, and being asked, " But the reduction which is to be permitted " becomes a matter of precise calculation, which ought to be laid down very accurately?" he replies, " I presume it has been, it ought to be." Then he says, " The opinions which " I have given were founded upon the assumption that the sectional areas above should " not be diminished to an extent which would be prejudicial. Certainly they ought not " to be." Now, Sir, Mr. Robert Stephenson's opinions have been referred to by my learned friend the Recorder, in his summing up, as entitled, as I am sure I shall be the first person to admit, to the very highest authority. I think you will find there is no substantial difference of opinion on the principles involved in and to be applied to the leading features of this Inquiry; there can be no essential difference of opinion between Mr. Stephenson and the other engineers, when the facts of which they are speaking are ascertained. The principle which he has there enunciated is, I apprehend, the proper principle for the treating of rivers. I have referred to what he calls the natural section as precisely that which is contained in this report, which is annexed to Mr. Rendel's appendix, No. 12; he gives instructions to Mr. Heppel, and Mr. Heppel repeating his instructions, says, " You had already determined that in order to diminish as little as " possible the quantity of tidal water admitted into the estuary, the height of the proposed " river walls should be limited by the level of half tide, at the same time you considered " that the widths between them should be such as to make the sectional areas more nearly " proportional to the capacities of the portions of the tide-way lying above them, thus " rendering more uniform the velocity of the tidal current." Now, Sir, I shall not do more than pray your attention to this particular appendix (No. 12); you will find all that is necessary to this calculation which is contained in those tables, and which are illustrated by sections which follow. Then he goes into the precise area and section of the river at different points, and having ascertained what, to use the language of Mr. Stephenson, is the natural sectional capacity of the river, he sees how he can deal with it so as to retain the same natural capacity and section. I ask, is not that the proper principle, and

Mr. Webster.

10th March 1855.

Questions 2419–2421.

does not any engineer who has never done anything of the kind subject himself to the suspicion, of parties who are interested in the river, as really proceeding in the dark, and not treating it in a manner in which it ought to be treated?

Now, Mr. Brooks is asked a question upon this point, "Have you yourself made from "those observations of Mr. Rendel's any calculation as to the cubical capacity of the "river?—No; it is all given in Mr. Rendel's calculations, which are delivered in. But "you yourself have not made any calculations of the cubical capacity of the river, of "the kind to which Mr. Calver referred in his evidence?—No; it has been all done by "Mr. Rendel, and he can give evidence upon that point; Mr. Rendel or his assistants. "Have you ever ascertained the quantity of tidal water that would be displaced by the "projected works, for instance, the Jarrow Docks? have you ascertained the quantity of "tidal water that will be displaced from Jarrow Slake, that is to say, yourself?—No; "not myself." Now, Sir, did Mr. Brooks know of the existence of this appendix to Mr. Rendel's report, or if he knew of it, did he know of the importance of it? He must, Sir, he is far too skilful a man not to have seen that these were the questions and that these were the data and the kind of examination upon which a question of this kind was to be conducted, and then to proceed in the way in which he has done, putting out his jetties here and jetties there for the purpose of operating upon this or that shoal, was, although my learned friend the Recorder thought it a word unbecoming the present august assembly, but "tinkering" the river, wherever such an expression had been obtained.

That circumstance, Sir, I say, is as one matter very strong evidence in support of the allegation which the minority have made, that this river has been treated upon no system, that is to say, on no such system as ever ought to have been adopted, and in no such manner as deserves the name of system. That Mr. Brooks has treated it upon what he calls a system I do not deny; but I say, looking at the way in which Mr. Stephenson says a question of this kind ought to be treated, and the way in which Mr. Rendel had treated it, as disclosed in that particular appendix, No. 12, and the other appendices, to which I will call your attention hereafter, that this river has never been treated by Mr. Brooks, or the existing Conservators, or their predecessors, upon anything that deserved the name of a system, thereby meaning such a system as ought to be applied to a river of this kind.

Upon another point closely connected with this, my learned friend the Recorder made some observations, namely, about these plans and the river lines. I have already said in my opening nearly all that I need do upon this point, but the important matter, and which the minority insisted upon, was this: they were aware of, and some of them knew, the struggle there had been to get into the Act of Parliament (the Tyne Improvement Act, 1850) that section 33, containing the provision for a plan showing the river works with heights and depths. That was a clause not contained in the Corporation Bill as deposited; it was a clause contained in the Conservancy Bills, as promoted by the Shields' party. That clause, as contained in those Conservancy Bills, provided for the inspection of the map for a shilling, the Corporation Bills provided that the map should be sold for a shilling. Now they come and say as a reason, but which is no excuse for their not carrying that out, the expense was so great that it could not be done. That was positively alleged here by more than one person in answer to questions from the Royal Commissioners, "Why have you not done that? at all events you might have done that; "it would have afforded the public some information, and would have been a proper com- "pliance with the Act of Parliament—it would have told us the level of the quays and show "the encroachments—but it has not been done. I cannot assign any other reason for it "than that it was far too expensive a thing to be done." Now, Sir, I do not mean to say that the alteration was intentional, nor do I assert that the excuse for not doing it was intentional, but I have had sufficient experience in parliamentary practice to know this, that when a clause is forced upon you which you do not like, the best thing is to put a word or two into it which will practically nullify it. Mr. Brunel said, when I pointed it out to him, that it was very far-seeing and deep-sighted. That, Sir, unquestionably is the fact, and it is a misfortune that such should have been the case. If that had been complied with, we should have had no such questions and no such contests as we have had upon these applications for encroachments from Messrs. Palmer and Leslie. The provision of such a plan would at once have removed a very large portion of the contest which has taken place at the Conservancy Board, and a very large portion of a complicated and unpleasant inquiry, which I do not propose to pursue here again to a further extent than has been pursued as to particular transactions which took place in granting licences, so called, for that very large encroachment, amounting to no less than eighty-four acres of foreshore, included in the licences to Messrs. Palmer and Leslie. It would also have removed the Conservators from the possibility of these species of complaints being made against them, if there had really been kept in the office of the Conservators a record of the grants which were actually made to those gentlemen. But there is no such thing. Why, Sir, is not that a thing unprecedented in the proceedings of a body like this, that, dealing with eighty-four acres of the the foreshore of a navigable river of the greatest importance to the public, and which ought to be under the control of either an Act of Parliament or the Admiralty, that no record of the application and of the grant shown distinctly on a plan, should be kept of it in the office of the Commission, so that when required to produce the plan here, they had to procure the plan from the parties? I say, that is one of the many things which were quite sufficient, I will not say to have irritated, but to have made gentle-

Mr. Webster.

10th March 1855.

men like Mr. Stevenson and others, who have no interest in questions of this kind except public interest, and an interest as shipowners, discontented with the course which had been pursued—it was one of those many things which go to make up the whole. There is no doubt that the beginning of this application was only for a very small grant to Mr. Palmer of some five acres, or something of that kind; but you know how the thing has grown, and you are also fully aware of the extent of the grant or licence, as stated in the memorial of the parties themselves, as to which, as between those two limits, the Conservators have come under some obligations, or some promise, or some understanding with Mr. Cuthbert Ellison, and the other owners of the soil there.

To complete this part of the case, I will only remind you, that although my learned friend the Recorder did not think it necessary to advert to it at all, you will find, Sir, that it was one of the distinct allegations and complaints that I made in opening this case before you, and as to which I referred to Captain Washington's report, in which he said, having reference to works generally—"That with reference to a general plan of improvement, no "works worthy of the name have been undertaken. Rennie's lines, deliberately and "carefully drawn, appear to have been abandoned without sufficient consideration, and a "line adopted, as far as it can be made out, which at times agrees with Rennie's, at times "falls far within it, and at other times as far without it." Several of the Commissioners on this Inquiry put pointed questions to my witnesses requesting them to specify instances in support of that allegation. They were not so conversant with the river works as some of us are, but the plans were before you which showed for themselves what was the existing state of things as regards the original lines and the present works. Mr. Brooks was cross-examined fully upon these points, and if you refer to his evidence, as I will do for another purpose hereafter, it will be plain and clear to you that, so far as regards that allegation of the irregularity that existed in those works, he admitted it to the fullest extent.

Pages 159–162.

I have asked what was the system which has been carried out? What is the system which my learned friend the Recorder says has been carried out? Is it anything really which can deserve that name, excepting in persisting in this system of transverse jetties? Mr. Brooks himself lays claim to that as the merit of his plan. He says, in his examination,—"These jetties are only made of timber; they consist of a few piles and three-inch planks to close the passage of the water; it is an exceedingly cheap mode of "changing the current of the water. I believe it has not been practised in any other "place, excepting by myself previously in the Tees, where I had effected a considerable "change of the navigation, reducing the low-water surface about three feet, and enabling "large ships to get up to Stockton," Now that, Sir, as I submitted to you in opening, was really the only system, the only thing that Mr. Brooks had carried out pertinaciously as his system. He represents it all as his own invention. Has that been supported by a single witness before you? It has been condemned on many occasions; but has it been supported by a single witness before you? Is it not contrary to all principle whatever, to refer to one class of witnesses who have condemned it, that same Shipowners' Society, a very important body, containing a great number of shipowners and practical men? I find at page 3 of that report, that at a meeting, which was presided over by Mr. Armstrong (the Chairman of the River Committee), and at which I find a number of the then Conservators were present, a resolution was handed in referring to the general bad state of the river; Mr. Clay being then in the chair, who is now a Commissioner, but who has not been called before you, who appears now to be promoting the views of, and acting with the Newcastle party, having been, as you remember, the depositary of those plans which were to go to the Admiralty; that resolution of the Shipowners' Society is this, referring the bad state of the bar, "thirdly, to the jetties or groins erected in various parts of "the river by the engineer of the Corporation," Now, Sir, there you have that Shipowners' Society, and also a memorial signed by, I think, more than 100 pilots and other practical persons, which appears in the appendix to the Inquiry before Captain Lawes and Mr. Abernethy, who refer to this as one of the causes of injury to the bar, and Mr. Clay, who presided on that occasion, makes this a matter of distinct complaint. He says,—"I cannot allow this meeting to conclude without observing that the majority of our "shipowners are strongly of opinion that the groins and embankments in the river are "seriously injurious to the bar. We draw the inference that instead of filling in "you should excavate; instead of putting in you should take out. We were further of "opinion that the embankments and groins in the river, by diminishing the scouring "power of the tide, had some effect in shoaling the water on the bar; and if that be the "case, we say you ought to retrace your steps and take measures for deepening the water "on the bar instead of closing it up."

Page 140.

(*Mr Seymour.*) What is the date of that meeting?

(*Mr. Webster.*) 1846. I refer to that, Sir, in support of this allegation, and no single authority has been found, or can be found for those transverse jetties that were then condemned, and have invariably been condemned by practical men whose attention was directed to the subject. As early as 1846, they were condemned by a memorial, signed by 123 pilots and shipmasters, which is printed at page 569 of the Report of Captain Lawes and Mr. Abernethy. Now, Sir, that would raise some presumption that this was a matter which at all events required some little consideration and hesitation before Mr. Brooks should be allowed to persist in the way in which he has been proceeding. Why do they object to them? You will remember the evidence of Mr. Straker and other witnesses.

Pages 43, 44.

Mr. Webster.

10th March 1855

I do not propose to trespass upon your time by going into any details; they stated distinctly that these are the objections—that they make holes and eddies; that they obstruct the tidal flow by reason of making inequalities in the current and in the channel; that they produce rapidly silting up, and that therefore they operate in both ways, first as making the current irregular instead of regular, and that they make holes in the bottom, and therefore banks either above them or below them, producing inequalities, and that such inequalities are as much an obstruction to the tidal flow as the positive exclusion of the water by the sand which silts up between them. Mr. Straker, Mr. Poppelwell, and other practical men give their strong opinion to that effect upon their experience at the present time; and in confirmation of the testimony of the practical men, confirmed, as it is, by the engineers, I said we have not had the shadow of an authority for them. The only thing that has been suggested by Mr. Brooks has been the lowering of the water at Stockton, getting two more feet. But, Sir, that had nothing to do with these jetties, that was produced by having made two straight cuts instead of several curves, and it is utterly misleading you and misleading every person of inexperience in these matters to suggest that. The only place in which Mr. Brooks has been allowed to practise these jetties is the Tees, from which he was imported into the Tyne. It is quite absurd to suggest to you that the improvement of the Tees, so far as regards the depth of the water, is due to those jetties, or that the Tees is a case in any respect analogous to the Tyne.

Mr. Robert Stephenson is as distinct in condemning these jetties as a man can be. My learned friend did not dare ask him the question precisely upon that point, but observe what he did say, and then see if it is not by implication as distinct a condemnation as any man could give, being as he is a witness of the highest authority, and who in other respects rather supports the views of the Newcastle party. He says, "I am acquainted generally Question 4098.
"with the encroachments. I refer to encroachments which are being made now by the
"engineer in the shape of jetties. I quite approve of that plan of proceeding, provided in
"addition you employed tidal walls, so as to make a quay." Now, Sir, is that an approval of the transverse jetties. Then again I ask him what is the system which he understands to be pursued upon the Tyne. I wanted to know from Mr. Stevenson, who is very well conversant with the Tyne generally, what is the system which has been so paraded by my learned friend. He says, "I have understood for years that they were adopting the plan Question 4182.
"of jetties with the intention afterwards of putting in longitudinal walls. I should be glad
"to know from whom you understood that there was any uniform system of this sort
"going on?—I have seen it myself, and I thought that it was uniform; there may be
"some little local difficulties, but I am not aware of them. I know the principle adopted
"by Mr. Brooks to be that of jetties to begin with, and ultimately longitudinal walls.
"Then am I to understand you to say that you approve of the principle of full-tide
"transverse jetties as the first step in treating a river of this kind?—I think they require
"to be used with great discretion; they sometimes do a great deal of harm, unless they are
"placed with great judgment." Then, Sir, he says in answer to the next question, "I look
"upon the space between every jetty as a miniature Jarrow Slake that has already silted
"up; it already absorbs a certain amount of the force of the tide, and some of the water
"will be between the jetties, and so long as it remains between the jetties they may be
"regarded as injurious, because they absorb momentum, and the jetties will not drive the
"tide I think much further up the river; but as soon as ever you begin to put in the
"longitudinal walls and confine the channel, then the tide will run along." Now, Sir, can you possibly have anything more condemnatory of tranverse jetties per se than that evidence of Mr. Robert Stephenson. Mr. Robert Stephenson was not asked, and might not have liked as a brother engineer to give an adverse opinion more than necessary, in distinct terms, whether he would ever approve of such things, or whether he did not condemn them as most injurious and pernicious. Any person looking at the reasons which he gives will see what must have been his answer if he had been asked; whenever a reference is made to them, he always couples them with the fact that they must be connected with longitudinal walls; for if not, all the mischief to which he refers of obstructing the tidal flow and silting up, without any corresponding advantage, will result from them.

Upon the suggestion that they are a step to a future work, that is a matter upon which we have had some more evidence, and to which I must now call your attention. Mr. Rendel Question 4057.
having said that as an engineer he knows that five years is not enough to test the principle or works of this nature, and that therefore he thinks "this is a case where we should be
"guided by experience, and by a reference to cases where nature works out and maintains
"a good navigation," further says, "we do know this, that in the case of every groin
"which has ever been made in a navigable river, that the strong current produced at its
"head digs out a deep hole, and that it raises a bank in the eddy caused by such current;
"a deep hole and a bank; we also know that these effects are increased as the height of
"the groin is increased. We likewise know there are cases where such groins greatly
"distort the stream and interfere with its momentum; the Dee, below Chester, is a case
"in point." Then, Sir, Mr. Brunel wishes him to draw a distinction between groins and Question 4062.
training walls, because of course joined jetties are training walls in one sense, and Mr. Rendel says, "There is a marked difference between the two. I suppose this sketch
"to represent the shores of a river; the object is to make a good navigable channel, by
"cutting off these bends and so straightening it; if to attain that object I run off high-
"tide groins from the shores, the several spaces between any two of them on the same
"shore becomes what has before been called a 'bulb;' hence the stream of tide becomes

Mr. Webster.

10th March 1855.

" strong between the heads of the groins and comparatively languid opposite the 'bulbs.' " But in addition to this available current in the intended line of channel, the tide when " it has acquired any strength will heap up on the sides of such groins, causing reflex " action at the structure between their heads, and give rise to cross currents; thus (*pointing " to the sketch*) continuing half-tide walls on the contrary secures a uniform current in the " channel between them, whilst they are uncovered, and when covered they do not cause " reflex action, or distort the current from the channel, though there may be some diminu- " tion in its velocity." That is, its general velocity, by reason of the expansion over the larger surface. " The advantage of training walls as compared with groins is stronger " still when, as in this case, you must submit to curves in the channel, and consequently " have to encounter the difficulties caused by not being able to keep the ebb stream in the " same course as the flood. These are my reasons for preferring training walls to groins, " and my reason for preferring in this case half-tide walls to whole-tide walls is, that I do " not think it safe, so far as the entrance is concerned, to diminish to such an extent the

Question 4063.

" tidal water." Then Mr. Brooks wishes this question to be asked, " May not these " groins be considered as the scaffolding to form the new line of shore more economically " than if they were not in their place?—I do not look at them as a scaffolding, and unless " they are connected by guiding walls, I look at them as the means of coercing the current, " and so force it to pass between their heads, and I cannot draw a distinction between " what you call the scaffold and what I should call the permanent work." There Mr. Rendel gives reasons which I think, coupled with Mr. Stephenson's evidence, must be satisfactory to every gentleman of experience in these matters, that as a river question these transverse jetties are matters which ought never to be admitted.

Question 4385.

This question, Sir, is revived again on Mr. Rendel's further appearance on the 12th of February, when he says, " Such jetties are in themselves economical and rapidly made, " and if the object be to get the portions of the shore between them rapidly silted up, " such groins are an economical mode or means of accomplishing it. The objection I " have always felt to them is, that owing to the rapid manner in which they reclaim the " shores, they commit the Commissioners to the plan of whole-tide walls; thereby, I can " see no economy in them so far as the future building of the whole-tide walls between " their heads is concerned. I cannot understand how that is to be shown." Then he is asked whether " full-tide jetties may be regarded as a very proper structure for making " land, but are not a proper structure for making walls with reference to conservancy pur- " poses?" and he replies, " Inasmuch as the whole-tide jetties rapidly reclaim the spaces " between them, but which in the meantime constitute a series of what has been called " 'bulbs,' they are not to my mind proper conservancy works, either as regards the future " or the present, if acted on as a rule instead of an exception." Well, Sir, does my learned friend cross-examine Mr. Rendel upon that point or suggest anything that is fallacious or is not strictly true? Why, Sir, he does not attempt it, and the only attempt my learned friend made in summing up Mr. Rendel's evidence was to say, Mr. Rendel has not adduced any precise instances or actual practice in support of his theory or what he says; that was, so far as regarded this point, the only way in which my learned friend attempted to deal with this class of evidence. It is only in the Tees and the Tyne that such jetties exist; in other instances in which they have been tried before for other purposes, except for mere temporary purposes, they have been rooted up, and this is one of those instances in which you must be guided by general principles, and if nobody can be found to adopt them but Mr. Brooks, either from opinion or in practice, the very absence of such evidence is strong support of the presumption that is raised against them.

Now here again Mr. Rennie has been attempted to be quoted in support of these full-tide jetties. I think a greater mistake or misrepresentation was never made; and upon what does that rest? Upon some fancied interpretation which is given to the sketch of groins made upon his plan. There is nothing in his written document in support of this suggestion. His report entirely contradicts it: of this I shall satisfy you immediately. But his drawing has been understood by Mr. Rendel and by other persons quite competent to judge of what is meant, as representing a half-tide groin, and nothing more; and that is perfectly consistent with his report. If you look at his chart of the Tyne you will find they are no more than just sketches or dabs of paint, showing a groin going away to nothing. With regard to the suggestion made, which I was very much astonished to hear come from Mr. Brooks, in the face of the known practice of Mr. Rennie and of his known principles, I ask you whether any inference can be drawn from them that Mr. Rennie was an advocate of full-tide transverse jetties? But what is his report? Why his report is as distinct as anything of the kind can be. I read from the appendix of Captain Washington's report, at page 108, this paragraph:—" The mode of contracting the river, where " required, I propose to be the same as that practised in the river Clyde, with the addition " to the plan suggested by me about 8 or 10 years ago, has proved so very successful, " namely, by building jetties from each shore, and moving the sand and gravel out of the " intended channel by means of dredges, and depositing it in the spaces by means of jetties; " and when the channel was brought near to the depth it was expected the water would " maintain, these jetties have been joined by walls of rubble stone, whereby the channel " has been preserved of a regular depth. Without these junction walls this could not have " been done, as the water would have spread between the points of the jetties and thrown " up sand banks, which would have rendered the channel full of shoals." Is not that, so far as regards the effect of such jetties, whether full-tide or half-tide, because for my pur-

Mr. Webster.

10th March 1855.

pose that is now immaterial, conclusive in support of the opinion of Mr. Rendel and other practical witnesses of what was the effect of projections into a river of this kind, making miniature Jarrow Slakes. "Without these junction walls this could not have been done, "as the water would have spread between the points of the jetties and thrown up sand "banks, which would thus have rendered the channel full of shoals. By the line of "jetties laid down by me the surface of the channel, supposing the tide to be confined "within these points, will be reduced to about 896 acres, namely, 448 acres less than it "now is at high water. Now the question is, how shall this deficiency of tide water, "occasioned by the contraction, be supplied? Towards the supply of this deficiency "there are several sand banks in the channel of the river, which are now dry at three "quarters ebb, and there are others which are nearly dry at half ebb. Of the former are "those at Jarrow Sands, amounting to so and so. In addition to this, I have to remark, "that the river throughout, I mean the contracted channel," (that is, the 896 acres to which he refers; that is, the navigable track, the channel of 896 acres,) "will be very much "deepened, and consequently the low water will be depressed in its surface; and, as the "flood tide will be much less obstructed, it will flow farther up the Tyne, and rise higher "than it now does. And, as it will receive the tide water in the first quarter of flood, and "will retain this water until the last quarter of ebb, it will produce a much greater effect "in scouring the bar, in proportion to its quantity, than it now does; and, in addition to "all these, it is proposed that the height of the jetties shall little exceed the height of half "flood, so that a principal part of the space embanked will still remain as a receptacle for "tide water." Now, Sir, is it to be tolerated, in the face of these distinct words, that a gentleman is to come and support his views by reason of a picture drawn upon that plan of Mr. Rennie's?

But, Sir, that is not even all, for if you look at the first paragraph of Mr. Rennie's report he draws a distinction between solid embankments, which he says, are not to be permitted. "A solid embankment on the side of a river must, therefore, be avoided, or, at least, "limited to a certain extent, and other means devised to effect the object." I shall have an observation to make upon that passage presently upon another part of the case; but I contend that upon this part of the case there has not been a shadow of authority adduced in support of these full-tide jetties upon which Mr. Brooks pins his credit, and which have been carried out in the Tyne. They are against principle and against practice. They have been condemned by every person so far as I can ascertain, or as far as appears, except Mr. Brooks himself.

Now if it be true that these full-tide jetties, unconnected with walls, make irregular beds and make irregular currents, and if it be true that uniformity of bed and sides is as essential to the proper induct and flow of the tidal volume as any other element, have the minority afforded no evidence in support of their allegation that the majority have insisted upon pursuing a pernicious system of engineering? What engineering has there been but full-tide jetties? that is in the present state the so-called system. They are the only works. A great many questions were asked by some of the members of the Commission of different witnesses about other works. My learned friend says triumphantly they could not point those out on the Tyne, and for this very good reason, that there are no works that have hitherto gone on upon the Tyne. That is part of the grievance. Until the commencement of the Hay Hole Docks, the only thing done upon the Tyne was the making of these full-tide jetties and reclaiming this land, which has been the subject of former Inquiries. Therefore I say that it was in principle a pernicious system of engineering. How have those jetties been carried on? Why it appears most distinctly upon inspection of any of the plan that those very jetties have been protruded without reference to any line, some as much as 100 feet, and some 160, and some within that; so far as regards the line of those jetties, they have protruded out without reference to any line whatever. For what purpose? Why Mr. Brooks tells us that he protrudes them out and makes them longer or shorter for the purpose of operating upon the shoals in the river. In his report, which he did not deny when asked upon cross-examination, his theory was and his representations were, that these jetties so protruded were to operate upon the bed of the river and the sides; they were to make a navigable channel up to Newcastle 18 feet without dredging. You must have been somewhat astonished, I think, in the face of such representations, and such a so-called system, that there had been no less than 18,000*l.* spent in dredging within the last three years; contrast what has been spent in dredging in the last three years with what had been spent in former times. Except in the removal of the Tynemouth Shoal, which was the operation of one dredger, there having been two dredges and one sold, there was scarcely any dredging at all, Mr. Brooks having represented that these full-tide jetties were to render dredging unnecessary, but athough you find such to have been his representation, although he has had full latitude and full power to do whatever he pleased about putting out full-tide jetties, and in defiance of the express votes of the Commissioners, although with a limited sanction, on the ground that they were only experimental and temporary, it stares you in the face that you have an expenditure of no less than 18,000*l.* to remove shoals, some of which those jetties have created, the Jarrow Shoal for instance, upon which you have had so many remarks already that I think it unnecessary to make any more. Now if this be true, if this be the only system, and if it be unsupported either by authority or practice or principle, and be a pernicious system of engineering, and have failed entirely to produce the results which Mr. Brooks represented it would do, namely, make this good channel up to Newcastle without dredging; was Mr. Stevenson justly subjected to the censure of my learned friend the Recorder, because he had taken upon

Mr. Webster.

10th March 1855.

himself to say that he considered Mr. Brooks' system of engineering had failed entirely? Can you, Sir, have a better test of the failure of a system than that? the representation of the author himself that it would do without dredging, has been entirely falsified as established by the enormous expenditure which has taken place already upon dredging, and the necessity of the dredger going to other places where it had not gone before. Suffice it to instance only one, the works of the chairman of the Conservancy, whose works have been very badly silted up, and who deserved a good deal of dredging, as Mr. Brooks said, but he had not got any yet. Mr. Stevenson being well aware of what he was talking about, and most competent to form an accurate opinion upon it, and most incompetent to represent anything he did not believe to be perfectly true, read from Mr. Brooks' report, when Mr. Brooks says (it appears at page 94 of the evidence),—"For this purpose I "advise the temporary lengthening of the two jetties on the west side of Hebburn Quay, "the westernmost to an extent of 66 feet," and then having referred to various certificates and to various reports, and to the representation that they would get over various other shoals without further expense in dredging, and upon such representations he says the works and jetties are experimental, was not Mr. Stevenson justified upon those facts in saying as he does with reference to these very jetties, "I am decidedly of opinion that they "have been a total failure." Sir, I say that certainly upon those assumptions and upon those facts as proved by Mr. Brooks' own lips and his dredging returns, Mr. Stevenson was perfectly justified in saying that Mr. Brooks' jetties had been a total failure. What does Mr. Danson say upon this point, who is the officer of the Conservancy, the Harbour-master, a person of practical experience, who knows the river well, and probably upon a question of this sort his opinion is as valuable as anybody's? Mr. Danson says, "Mr. Brooks "advised the Corporation of Newcastle that the dredging machines would be no longer "required, because his jetties would answer all the purpose. I said from the first when "they were put up, that they would do a great deal of harm to the river, and I told "them exactly what they would do, that they would fill up the Bill Reach, and instead of "draining the sand from Hebburn Shoal they have made it worse. The jetties, instead of "doing good to the river, have made it worse?—No doubt of it. In my time the first serious "obstruction in the river that I recollect was the Tyne Main. The following one, Ellison "Main, was not so bad. The Hebburn Shoal happened to be the worst for a considerable "time. Some twenty years ago Hebburn Shoal was the first obstruction from the sea. The "first from the sea now is Jarrow. That has been very bad recently, but there has been one "which has risen a little higher up. The channel generally has become considerably nar-"rower lately, at present there is a little more water, but it is very narrow. Everything "that has been done to the river has been by the dredging. The jetties have been of "no manner of use whatever. When those jetties were put out at the east end of Heb-"burn Quay, the dredger commenced working, and as soon as the jetties were finished the "dredger was taken away and the dredger made the water."

(*Mr Seymour.*) Read the next question.

(*Mr. Webster.*) He is asked, "Whether it was the dredger that made the water, or the "jetties that made the water? as a matter of fact, is what has been called the mid-channel, "without reference to the breadth, generally deeper or shallower than it was?—It is "better." Why, Sir, no doubt when you have Mr. Brooks protruding these jetties into the mid-channel almost, in some of those places making the channel so narrow that only one ship can lie where several used to do; and when you have these notices which Mr. Stevenson and the Harbour-master spoke to as being rendered necessary by these works, it would be astonishing if that had not made it a little deeper; that is one of the things complained of, and our memorials admit that there is a deeper gut up to Newcastle. But what is the capacity of the navigable channel? Its capacity, depth and breadth, may be taken as conclusive evidence that the representation of Mr. Stevenson, and upon which my learned friend commented so sharply, was perfectly justified, that Mr. Brooks' system of jetties, so far as they can be called a system, or so far as they have been tested, has been an utter failure.

Mr. Straker gives you evidence to the same effect, that the jetties would have been inoperative without dredging; but, Sir, notwithstanding all this, this system is persisted in, in defiance, I was almost going to say, of the wishes of a large number, very nearly the majority, of the Commissioners, because you remember well the discussions that took place at the meetings of the Commissioners, as spoken to by Mr. Stevenson and other witnesses, that Mr. Brooks was allowed to go on with certain things as only experimental, but although experimental, yet they became the same kind of permanent works as those of which we have already complained.

We have had it alleged, and Mr. Danson admits it, and the memorialists admit it, that the channel is in one sense improved; we have had the changes rung upon it, Is the navigation improved? Yes, the navigation is improved. What is meant by the navigation being improved, so far as the facts bear it out, because there is no magic in terms? Why, it means that up to Newcastle you have a deeper gut but a narrower channel. I therefore, Sir, say that the observations of my learned friend the Recorder, that we did not call pilots, that we did not call this or that witness, was wholly out of place, because we never denied that the result of this system of operation was to make the channel in one sense deeper. But, Sir, what is the practical test? Do larger vessels go up better and more easily now than they did 50 years ago? Why, you remember as a practical question how that has been already dealt with; you have had evidence of vessels drawing quite as much water having gone up formerly as now. It would be quite preposterous to contend, and

Page 94. Question 1138.

Question 1220.

Question 1500.

Question 1508.

Question 1512.

Mr. Webster.

10th March 1855.

absurd to deny, that this system of jetties and of dredging at the cost of an enormous sum of money could have been going on in the way it has been, coupled with the operation of steamers and increased traffic in the river, that in one sense there has not been an improvement in the channel, and I will give Mr. Brooks the full credit of that. But, Sir, at what sacrifice has it been obtained, and what has been the effect of it, so far as regards the general question of the harbour at Shields, the bar, and the general interests of the public? for those are entirely distinct questions, and if they be not separated, and the evidence be not applied strictly to each of them, great confusion and great misapprehension will result.

A part of this navigation has been properly described as the river. I believe Bill Point is the dividing line, which both Mr. Robert Stephenson and Mr. Rendel have recognized as the great distinction. Another part has been described as the estuary; then below that, another part of Shields harbour; another part, the Narrows; and then the bar. All those are distinct matters. Does Mr. Brooks or anybody pretend to say that these works have done any good to Shields harbour, or the Narrows, or the bar? Why, Sir, you have it in evidence that the bar itself from natural causes will be two feet better at least at one time than another. Pilots and other witnesses told you that at certain periods it was a good bar, they have known the time it was two feet better. Had Mr. Brooks anything to do with that? Is it not entirely misleading you, and occupying your time with useless discussions whether the bar is six inches more or less, when it is clear upon the whole of the evidence that there are general causes which will make a difference of at least two feet? The conflict and complaint as regards that is not that the bar may not be now two feet better or worse than it has been at some former time, but that the bar should not many years ago have been made from 6 to 9 feet better, and permanently retained so, which might have been done if the most ordinary skill and the most ordinary precautions, or a very small portion of the money raised from the shipowners, had been applied to it. The same observation will arise unquestionably about Shields harbour and the Narrows. I am not going to occupy your time upon homœopathic questions of feet or inches of water, when you have natural causes that will account for variations much greater than have taken place, when you have larger ships going into Shields harbour, and when you have different alterations in the position of the moorings and other causes which operate in a similar manner. Is there any connexion whatever between this alleged improvement which Mr. Brooks has been endeavouring to make out upon the recent survey of Mr. Comrie, between the bar and harbour at Shields, and what it was in Mr. Rennie's time and in 1849? Have these local alterations and supposed improvements any connexion whatever with these inner works? I apprehend you will say that it really has not, whatever may be the result of the examination which you have so considerately taken, and will be so satisfactorily performed, as to the relative sections at those places, the bar, the Narrows, and Shields harbour. Those are matters which, if they exist as alleged, have not been improved by any engineering operations, although by reason of the exclusion of the tidal water they have very probably been interfered with.

I have already referred you to that appendix, No. 12, of Mr. Rendel's report, in which you will find a discussion as to what ought to be the precise form of the sections of the river. The river above Bill Point may or may not be better according as you view the question of deep or narrow channel; the low-water surface may or may not be depressed at Newcastle. We have heard a great deal about the Tynemouth Shoal being gone; we have heard a great deal about the operation of steamers and their effect in improving a channel; those two causes are quite sufficient if it were necessary to resort to them, or worth the trouble of resorting to them, to have accounted for what Mr. Brooks suggested to be the fact, although the proof of it is very doubtful, of the depression of the low-water surface at Newcastle. But, Sir, that is not a question in which the Conservators of the Tyne on behalf of the public are interested. It is not the depression of the low-water surface only, supposing it should have taken place, or supposing the causes to which I have referred are not sufficient to account for it; but it is. Has the high-water surface also been elevated so as to increase the tidal volume that comes in? Now there is not a tittle of evidence of that; it is, on the contrary, admitted by Mr. Brooks; so far as the tidal diagrams are concerned which he has produced as selected tides, taken at the period of the year September and October, so far as they can be relied upon, they show that there has been a depression of high-water surface there, in that respect confirming conclusively the evidence of Mr. Rendel.

A great deal has been said about the low-water capacity of the river, and a discussion has taken place between Mr. Calver and Mr. Brooks, to which Mr. Heppel, for Mr. Rendel, has been a party, as to whether that has increased or not; this you will find in the original documents of Mr. Rendel; and you will remember, Sir, how this question arose. It is necessary I should go into it, because I cannot but think that considerable injustice has been done to Mr. Calver, or attempted to be done to Mr. Calver, by the cross-examination and observations of my learned friend. Mr. Calver had told you what was his original employment, that when the Admiralty Inquiry, in 1849 took place, he was selected on the part of the Admiralty, and on the part of Mr. Nicholson, the then engineer of the Conservancy party at Shields, and Mr. Brooks, to ascertain certain sections; he is, as all of you must know, a most experienced surveyor, probably a man of as great accuracy and of as much experience as has ever been engaged in Her Majesty's service. He tells you in his evidence that in 1849 he was engaged at Shields; he was appointed to take those sections, Question 1574.

Mr. Webster.

10th March 1855.

Question 1576.

as I have mentioned. He says, "I took sixteen for the Newcastle engineer, sixteen for "the Shields engineer, and nineteen for Captain Washington;" that was for Mr. Brooks, Mr. Nicholson, and Captain Washington. Then when he made the sections, this is in 1849, I pray your attention to this, "When I made the sections, I did so with a view to "make a comparison of the states of the river in the two periods of 1813 and 1849. "Mr. Brooks, who was the engineer to the Corporation, selected his sections opposite his "artificial works, imagining that my comparison was merely to be limited to the distance "expressed by those artificial works, whereas that would only form one part of the com- "parison. I was forced to set against any gain which might have been formed by such "contraction any loss which might have followed from it as a direct consequence. When "it was found that this was the only comparison which I could make, those sections were "not called for." Now, Sir, that was in 1849. Mr. Calver was examined as a witness on the 21st of May 1849, in the House of Commons, on the Conservancy Bill. My learned friend the Recorder has already referred to the evidence. Mr. Calver gave evidence upon the sections which had been pointed out by the three parties, and to the effect that they showed a decrease in the capacity of the river, and therefore inferentially in the quantity of tidal water coming into the river; and when Mr. Brooks was called and was examined upon these sections, he objected to Mr. Calver's sections, saying they would be a true test if the river flowed straight on between the banks; but in the case of an oblique river running across, that such a test would not answer, or was inapplicable; that the sections should be taken obliquely in the direction of the river where Hebburn Shoal makes an oblique natural weir.

Now, Sir, I have called your attention to that, because it appears to be the beginning of the confusion introduced by Mr. Brooks into the whole question. Mr. Calver was required to measure certain sections for the purpose of ascertaining the capacity of the river; they were unfavourable to the result of Mr. Brooks' works, and Mr. Brooks mixes up the question of oblique sections, which is a question of the discharge of water, with the question of transverse sections, which is a question of capacity for water. You will find in the contest which has gone on between those gentlemen that a good deal of the evidence which Mr. Brooks has given you is pervaded more or less by that same confusion and same mistake. I do no more now than call your attention to that, as a matter to be kept in your consideration in reading some of the evidence.

That was the state of things in May 1849. Mr. Calver was employed subsequently to make that most elaborate report, which lies upon your table, to the Admiralty. He is

Question 1577.

asked with reference to these sections, "Did those different sections enable you to ascertain "and compare the transverse sectional areas as they then existed at different parts of the "river?" and he replies, "For that mere rapid examination it was sufficiently accurate; "but immediately after that I entered upon a legitimate survey. This was merely for "operations in the spring; but when the Bill was lost," (that was the Conservancy Bill in 1849,) "as I understood from the session coming to a close, on account of the contradictory "statements which had been made, it was considered judicious on the part of the Admiralty "that I should go down to the Tyne immediately after the session ended and make a com- "plete survey of the whole river, from the bar up to Newcastle Bridge, taking Mr. Rennie's "survey as a basis. The plan of Mr. Rennie was very perfect; he had got 286 sections "between Shields Narrows and Newcastle Bridge. Every section could be immediately "identified. He had also, fortunately, left on record his datum to which all his soundings "referred. It was a certain notch in the south-west corner of the Low Light at Shields. "I went to that corner, found the notch, carried it by levelling throughout the river, "referred each of these 286 sections to the same datum line, proved what was the condition "of the bed of the river in respect of the level, as far as capacity was concerned, and upon "that I made an elaborate comparison of the size and the navigable condition of the river. "There were two distinct examinations, one only for a temporary purpose in the spring, "and the other was really an elaborate careful survey." He states the result of that as

Question 1637.

follows:—"In my survey, in every instance I identified the position of each section, and "re-sounded them, using the 15-feet dead level of Mr. Rennie, carried throughout the "river, to refer the bed of the river of 1849 to. In consequence of this, each section "became a distinct point of comparison. That enabled me to calculate the difference of "the river, considered simply as a receiver, between 1813 and 1849. The result of a "comparison of the sections showed that the river, simply as a receiver for tidal water, "had decreased one twenty-second part in capacity. Then I took Mr. Rennie's report, "and in his report you will find he states, that on May 31st, 1813, there were 726,621,000 "cubic feet of tidal water admitted into the Tyne; one twenty-second part of that was "34,261,000. Mr. Rennie's report was the only thing I had before me: it was the only "comparison I could make. If Mr. Rennie's calculations had been before me to tell me "how he got the 726,000,000, it would have been a little more satisfactory. I should "have seen exactly the nature of his calculations in determining the tidal contents; but "that not being in existence, I could merely treat the river as a simple receiver, and the "reduction of its capacity as a receiver. I applied immediately to the reduction of tidal

Question 1638.

"water. I did not base my calculation on the supposition that the tidal receptacle was "filled at the same time at the bar and at Newcastle. No tidal receptacle is full at the "same time. It is impossible. The veriest tyros in such matters know that. I merely "assume this, that, on account of Mr. Rennie's celebrity as an engineer, he would make a "proper calculation of the amount of tidal water admitted into the river. He has stated

Mr. Webster.

10th March 1855.

"that on the 31st of May 1813," (I assumed that he had made the right calculations,) "it "is evidently the safest plan for me, simply wishing to arrive at the fact, to assume that "he made that calculation correctly; and I then applied the reduction of one twenty-second "part of it. My calculation had nothing whatever to do with such an idea. It is a thing "which cannot exist in nature, of course."

Now, Sir, that was the evidence and the substance at least of what was contained in Mr. Calver's report to the Admiralty. You will see the way in which Mr. Calver was dealt with by the learned Recorder, upon what must have been a strange misapprehension, for I can hardly think it to have been wilful on the part of Mr. Brooks. Mr. Calver's comparison was of the capacity of the river as a tidal receptacle at the two periods. He tells you then, in his evidence, the ratio which, as a ratio of increase or decrease, was wholly independent of the actual quantity; that is to say, it was wholly immaterial whether the precise number of millions of cubic feet which Mr. Rennie had assigned was true or not. Mr. Calver showed upon a calculation of the capacities what was the relative capacity at the two periods; therefore, any error that Mr. Rennie might have made, if the kind of error Mr. Brooks has suggested had been made, would have been eliminated in the inquiry and comparison of Mr. Calver. In this respect it was different from the elaborate result that Mr. Rendel had obtained from Mr. Heppel, which is contained in Appendix 10 to Mr. Rendel's report. One of those appendices, which is seen and read now for the first time, and which gives the comparative acreage low-water capacities and tidal capacities of the river in 1813 and 1849, showing their increase and decrease between the two intervals for six distinct sections of the river, that is to say, from Newcastle Bridge to Bill Point, and so on to the Narrows, the result of which, according to Mr. Heppel's calculations of capacity, because his is a calculation of capacity simply, upon the same principles between the periods of 1813 and 1849, is, there had been an increase of 9 per cent. upon the low-water capacity, but a decrease in the capacity as between low water and high water amounting to $3\frac{1}{2}$ per cent., and a total decrease of $\frac{6}{10}$ths. That agreed substantially with Mr. Calver's report to the Admiralty, excepting as regards the low-water capacity. The material element here, the tidal volume, which is the difference between high-water capacity and low-water capacity had been diminished, both upon Mr. Calver's and upon Mr. Heppel's statement. Mr. Rendel made this discrepancy between Mr. Calver and Mr. Heppel the subject of instructions to Mr. Heppel for re-examination in the document (Appendix 12) referred to. That is a document of the greatest importance, and I am surprised that Mr. Brooks should have written that pamphlet, and instructed my learned friend the Recorder to subject Mr. Calver to the kind of cross-examination he did, when he must have known or ought to have known what was contained in that important document; a document most creditable, I must say, to all the parties concerned, Mr. Heppel and Mr. Calver; most creditable to the talent and skill of Mr. Heppel. On the 30th of January 1851 Mr. Rendel gave instructions to Mr. Heppel to review his former sectional computations, upon which the plan of Mr. Rennie and Mr. Comrie were made, and Mr. Calver's report to the Admiralty contained in the book which is lying on your table. Mr. Heppel was instructed to compare his former calculations with Mr. Calver's, and to report upon them. Mr. Heppel, not quite understanding the principle upon which Mr. Calver had gone, writes to him for information upon the subject; as to which, he says, "I applied to him through you (Mr. Rendel) for certain information, which he was good "enough to furnish in two letters, from which I extract the following:—First the "mean depth of section was obtained by taking the exact depth upon the section at "half-chain distances between the high-water boundaries. The sum of all divided by "the number of instances, yielded the mean depth; this again multiplied by the breadth "of section yielded the sectional area; exactly the same system was followed with both sur-"veys, so as to ensure a perfect comparison." So that you see, Sir, whatever might have been the inaccuracy—because, of course, there are always, to a certain extent, inaccuracies—due to the system that Mr. Calver pursued, as there are to every system, yet inasmuch as he had applied the same system both to the state of things in 1813, and to the state of things in 1849, the comparisons would have been free from inaccuracy, because they were comparative results. Then he says, "I accepted Mr. Rennie's high and low water contents "in cubic feet, as stated in his report as correct. Then having cleared out the sectional "areas of both surveys, and found the exact decrease, I allowed the same decrease in the "cubic contents; for example, supposing the high water sectional areas over the whole "river to have decreased one-twelfth, then I reduced Rennie's high-water cubic contents "by one twelfth, and so with the low-water area. Mr. Heppel will perceive that the "object I had to arrive at was a comparison of size, and it mattered not to me whether "Mr. Rennie's calculation of the contents of the river was correct or not; for whatever "were the contents, I found the tidal river below Newcastle Bridge to have diminished "about one twenty-second part." Then, Sir, Mr. Heppel, finding this discrepancy between his low-water capacity and Mr. Calver's, goes into a discussion as to the true principle of calculating the low-water capacity, by reason of the bottom of the river being of the very irregular surface that it is; and he thinks, construing an ambiguous expression in Mr. Calver's letter in a certain way, that Mr. Calver had divided by the number of heights instead of the number plus one. I understand, Sir, that such was not the fact. However, it is immaterial. I understand some correspondence took place between Mr. Calver and Mr. Rendel upon that point; and in point of fact, Mr. Heppel had misunderstood rather an ambiguous expression in Mr. Calver's report upon it; that is quite immaterial; but it is right if the fact

Mr. Webster.

10th March 1855.

be so, which may be ascertained, and I am told it is so, that it should be known that Mr. Calver took every pains he could to satisfy Mr. Rendel, if there was any incorrect supposition as to what had taken place. Mr. Heppel having pointed out what he calls a discrepancy, and which might be sufficient to account for the discrepancy between the two, proceeds in this way: "I infer, therefore, from the foregoing considerations, that the principle on which "Mr. Calver states his sectional areas to have been computed, involves an error, which lies "between the limits of nothing and that fraction of the whole area whose denominator "is the number of soundings in the section; that in cases where the extreme soundings "are very small, as compared with the middle ones, this error does actually approach such "a fraction of the whole quantity, and that it becomes the less considerable as the ex-"treme soundings become more nearly equal to the middle ones. Now the effect of this "is, that the low-water sectional areas, as computed by Mr. Calver, should differ from the "truth by a much larger proportional part than the high-water ones." Then he gives the reasons, with which I need not trouble you. Then he goes through a most elaborate comparison of the quantities which they, both of them, arrived at; and he arrives at this conclusion, a matter which I should have thought Mr. Brooks must have been well aware of when he instructed my learned friend the Recorder to make that cross-examination of Mr. Calver. "This near correspondence in the value of the cubical contents of 1849, "whether inferred on Mr. Calver's principle from those of 1813, or deduced from the sec-"tional areas by a separate calculation, seems to me to be good evidence of their having, "in both cases, been correctly deduced from the sectional areas; and as I have already "shown why I prefer my estimates of the latter to Mr. Calver's, so, consequently, I must "prefer my cubical contents, which the foregoing would appear to show to have been "properly deduced from them. It must, at the same time, be remarked, that the error "I first pointed out in Mr. Calver's low-water areas is inoperative on his inference of the "cubic contents, as affecting the calculations of both periods proportionally, it disappears "from their ratio, which alone is essential to this process." Then he goes on to say, "I "am only, from this examination, the more confirmed in my belief of the near approach "to truth of the following statement: that the high and low-water contents of the Tyne "between Newcastle Bridge and the Narrows in 1813 were 954,000,000 and 209,000,000 "cubic feet respectively, and (Jarrow Slake being supposed to have remained unaltered) "that the high-water contents had, in 1849, decreased about 0·7 per cent. while the low-"water contents had increased about 9 per cent., it being always recollected that the terms "high and low water refer to the levels determined for them respectively in Rennie's sur-"vey of 1813." You will remember, Sir, that Mr. Calver told you on his examination in answer to the questions of my learned friend the Recorder, that even if there had been any suggestion of inaccuracy—but my learned friend the Recorder did not seem to be very well aware what the kind of inaccuracy was—that it was wholly inoperative upon the comparison. Mr. Heppel tells you upon the elaborate inquiry, that this was the fact which Mr. Brooks must have known of, yet Mr. Brooks, subsequently to the date of this report, writes that letter which Mr. Calver answers, and notwithstanding the explanation which Mr. Calver gave here in regard to it, comments upon that as if nothing of the kind had taken place, as if Mr. Calver had made a serious mistake, or was even doing more, attempting to mislead the Commissioners as to the results. I say Mr. Brooks could hardly have been ignorant of the explanations afforded, and must have been aware of the discrepancy between Mr. Heppel and himself. 9 per cent. was a matter of no little consequence as regarded the comparison, and if he were aware of it, he was not justified in subjecting Mr. Calver to the cross-examination and to the insinuations which he did; if he was not aware of it, that, I think, shows that Mr. Brooks, from the multitude of his engagements, is not quite so accurate a person or so well informed as he ought to be.

But, Sir, this report of Mr. Heppel's carries the matter still further, and it does this; he compares Mr. Calver's high-water breadths at the two periods, and also the ratio of the high-water breadths and the high-water areas, and he (Mr. Heppel) finds this most remarkable coincidence between them, that the high-water area given by Mr. Calver being 1,672 in 1813, and 1,577 in 1849, Mr. Heppel finds it to be 1,659 and 1,602, showing a decrease by Mr. Calver of 5 per cent., and by Mr. Heppel of 4½. Then as regards high-water breadths, he finds Mr. Calver represents it in 1813 as 1,009, and in 1849 1,945; he (Mr. Heppel) 945 and 908, showing a decrease, as found by Mr. Calver, of 4-$\frac{6}{10}$ths, and Mr. Heppel 4 per cent. Can you possibly have anything more satisfactory or conclusive of the accuracy of Mr. Calver's results, than confirmed as they have been by this report of Mr. Heppel's, which was one of those documents in the possession of the Commission, of which Mr. Brooks ought to have known the contents, and of which the public and the Commissioners ought to have known the contents, before they instructed my learned friend to subject Mr. Calver to the cross-examination which he did with reference to that point.

Those documents, Sir, as you are well aware, Mr. Clayton told you had been in the possession of Mr. Brooks from the time he (Mr. Clayton) received them from Mr. Rendel, and probably but for this Royal Commission would have been consigned to oblivion or destruction, though, upon inspection, they will turn out to be some of the most valuable documents ever prepared with reference to any navigable river.

Having felt myself bound to explain that matter, which, as it stands upon the speech of my learned friend, and upon the cross-examination, could not but have been used apparently to reflect upon Mr. Calver's accuracy, not to say his candour, I will return to the question which I was immediately upon, which was this, that whatever may be the precise

truth of the matter about the low-water capacity, that is not a question which is material to the inquiry as an estuary question. The low-water capacity is an important question, simply as a question of a navigable river, but it is wholly immaterial so far as regards the estuary question—the material element upon the estuary question with regard to the Narrows and the bar being the quantity of tidal volume that comes in, that is to say, the capacity between high and low water mark, which, both upon Mr. Calver's and Mr. Heppel's calculations, I believe, were found to have decreased to the extent of nearly $3\frac{4}{10}$ths per cent. between the two periods of 1813 and 1849. That difference represented by $3\frac{4}{10}$ths per cent. is, as to the actual quantity, a very large figure, being very nearly 30,000,000; this $3\frac{4}{10}$ths per cent., which Mr. Heppel finds to have been a decrease in the tidal volume of capacity between high and low water mark is, I believe, when reduced to figures, a decrease of from 26,000,000 to 30,000,000 cubic feet.

Mr. Webster.

10th March 1855.

Now Mr. Calver has told you that this question of low-water capacity was a matter that was quite different from general estuary questions. He is asked some questions upon it by the learned Commissioners, and he says, "Though it may be larger, it is not implied "that it is superior as a navigation as to simple depth certainly. The object being to "make the river as efficient as possible for navigable purposes, an increase of depth, "provided it has sufficient width for ships to pass up and down, must be an improvement, "if in connexion with a strict preservation of the quantity, because they are two questions "entirely. An increase of depth simply will be an advantage to any vessel passing from "Shields to Newcastle." That is to say, the question of the river and the question of capacity are entirely distinct from the estuary question and the tidal volume that enters in. He says further upon that point, "The great object, if I may so call it, is to maintain "the port and the bar as the first object, and as a matter of experience I say to do that "you must retain the tidal contents; that is the first thing for a judicious conservator, in "an important river like this, to take notice of. Then the second one is the transmission "of vessels from Shields at the port (which is certainly valuable to the public) to the "higher part of the river, to the parties who wish to receive the vessels; they are two "questions altogether." They are obviously two entirely distinct questions, affecting different interests.

Questions 1807–9.

Question 1853.

The low-water capacity and the tidal volume being, then, two distinct questions, the low-water capacity an element in the question of the passage of the tidal volume only to this extent, that if you have a good, improved channel, that is to say, a channel which is made a good conduit for the passing of the water, you probably will have a channel of larger low-water capacity also. But, excepting upon that view of the case, there is no connexion between them, for it is obvious that you may have a very improved channel as to depth, well adapted for steamers and purposes of that sort, but a very inferior channel for shipping, and also a channel in the worst possible state for the passage of the tidal volume. This was well known to Mr. Rendel and to all engineers who have taken up this subject as a whole. You will find, in Appendix No. 7, one of those documents which have been laid before you, that he gives you plotted sections of almost every part of the river, and the importance of that in this Inquiry was well known to Mr. Rendel and to Mr. Brunel, who put some questions specifically upon it.

You will also remember, that in the Inquiry which took place between Mr. Brunel and Mr. Rendel as to the difference in the abstraction of water between half-tide and full-tide walls, it was suggested whether the loss due to the full tide walls was anything more than a wedge, a triangular wedge, the base of which was the difference between a full and half tide wall, and the angle of which was the apex of the triangle, the vertex of the triangle running up to high-water line. Mr. Rendel said that was not the case—it was greater than that, for two reasons. On the examination of those sections, which are in Appendix 7, you will find that the sides of the Tyne throughout a very large extent are cliffs or small quays, or rather perpendicular shores; and also, that with half-tide walls, subject to the wash and the operation of causes going on in the Tyne, the ground would not grow up even to half-tide level, so that the deduction to be made was not a simple triangular wedge, the base of which was the difference between the half-tide and the full-tide walls, but it was a quadrilateral wedge, one edge of which was the difference of height between full and half tide walls, and the other edge was the cliff shore, which is shown by the sections to exist in a very great number of cases, and which, in the Tyne, would amount to a very large quantity indeed. Then if Mr. Rendel was right, and the other witnesses were right, in saying that the bank would not grow up even to the level of half-tide walls, but that there would be a wash which would keep it down to below that, it becomes an element of the greatest importance in ascertaining this question, as to what you can venture to do with this estuary, so that the probability is, that the loss would not be the length or width of that wedge into the half of the difference of height between full and half tide, but it would be more likely that length or width into two thirds or three fourths of the difference of height between full and half tide, making upon the Tyne an immense quantity, many millions of cubic feet. You will find that Mr. Brunel pointedly goes into this. He asks Mr. Rendel upon this point, "I wish to drop the question of the full-tide groin, and to "consider the two cases of a half-tide training wall and a full-tide training wall. The "cross groins at present constructed in the Tyne, we are informed, are only made as a "process for arriving at a full-tide wall with full ground behind. It may be a less safe "way of arriving at it, but it is alleged to be cheaper; and without going into the question "of whether it may produce some mischief during the progress of the works, the question

Page 304. Question 4064.

Mr. Webster.

10th March 1855.

" is simply as between a full-tide training wall, ultimately with solid ground between it " and the shore, and a half-tide training wall, with freedom for the water to pass beyond " it up to the high-water mark. I understood you to say just now that you were de- " cidedly of opinion that the effect of the tidal wave would be, generally speaking, greater " and more beneficial up such a river as the Tyne with half-tide training walls and the " free flow of the water, than with full-tide training walls and a reduced amount of tidal " water?" To which Mr. Rendel replies, " My opinion is, that the result would be very " nearly the same as to the propagation of tidal water up the river." That goes to another point, upon which I shall have occasion to make an observation presently, but I will read the whole together, because it is more convenient. " I do not think there would be much " difference, but the advantage of half-tide walls would be, that you would by them attain " all that you could desire in the way of propagating tidal water up the river without also " diminishing the quantity to an extent that might endanger the sea entrance of the river. " I must repeat it is a compromise. In all these cases it should be so taken, and that " which makes the safest compromise, reasonably attaining the object desired, seems to me " the great object to be attained in such a case of engineering as this. I would therefore " say again, I hold that anything which would so diminish the quantity of tidal water passing " up the estuary of the Tyne as would leave its sea entrance in the smallest danger, is a " bad system, because all agree that the entrance is the key to the port; and that if we " can attain the same end as to works up the river by one means (at a smaller cost) than " we can by the other, it is clear that the half-tide walls is the best plan, although the " execution of such a plan might take a longer period, and some more inconveniences " whilst in hand, than the whole-tide groins, as well as more expense. But neither " their expense or inconvenience would approximate the cost of whole-tide groins as " a 'scaffolding' done, now added to a whole-tide wall to be built, when, as a " 'scaffolding,' it has done its work, namely, filled up the spaces between these groins."

Question 4065.

Mr. Rendel is then asked whether he "has made any calculation of the amount of " tidal water that really would be abstracted by carrying up these walls to full tide, " as compared to what would be abstracted by leaving them at half tide?" He " replies, " There were some calculations, I think, in the Appendix to my report. " I have not looked the papers over since, they are so voluminous, but I think " the abstraction was found to be very large. It was gone into very carefully. I directed " Mr. Heppel to calculate the area of the then tidal limits, and the cubic contents of the " water it contained at a high spring tide, also the area of a proper sailing channel, whether " for half-tide or whole tide walls. The difference between the two areas giving the area " of the portions of shore that would be embanked in the one case and left open in " the other. My recollection is that it would be about one half by a mean depth of

Question 4066.

" 5 feet." Then Captain Fitzroy says, " He gives all those particulars which you refer to " most fully, and also various capacities with reference to the different sections and areas? " I believe he does, and I know that he is very accurate in his calculations." And Mr. Brunel says, " Probably I may ask those who are interested in the result of this " question if they would find for me those calculations, namely, the cubical contents of the " water contained between high-water mark and the probable shore, which would, under " any circumstances, be formed after the half-tide walls had been in existence for some " time. I do not think there had been such calculations." Now Mr. Stevenson has had the kindness to look through those Appendices; he does not find the actual calculations, but he finds in Appendix 7 all the materials from which these calculations may be obtained. You will also find some calculation upon them, which probably will enable you, or Mr. Brunel, or any gentleman to whom it may be submitted, without much difficulty, to show something like an approximated solution of that very important question which Mr. Brunel has put. And, Sir, you will also find upon the large chart, Appendix 1, as it is called, consisting of those four sheets of the chart that Mr. Rendel prepared, the height of the quays and of the cliff sides as he calls them, the one shown in black figures and the other in red figures. I think it is stated on the list that has been furnished you by Mr. Clayton and signed by Mr. Rendel, that the level of the quays and of the bed of the river at the foot, and also the cliff sides, are shown upon the large chart, so that there are all the means of ascertaining that matter to which Mr. Brunel and Mr. Rendel attach so much importance. That, Sir, is again an illustration of that which Mr. Robert Stephenson had insisted upon as the natural section of the river, which is to be maintained, and without an accurate knowledge of which you ought not possibly to attempt to deal with a question of this kind. The fact is, that which will be quadrilateral wedge in a great number of cases is a very large quantity, which is wholly displaced by a full-tide wall and the solid land, and that there must either be a place found for it somewhere in the river, or it must be prevented from entering the river at all; and if it is prevented from entering the river at all, to that extent are the bar and the channel deteriorated. And therefore, Sir, it is perfectly impossible for any gentleman acquainted as Mr. Stevenson the Commissioner is, with the true principles upon which a question of this kind is to be taken up, to rest satisfied in the absence of all information upon a point of this kind such as is disclosed in the several Appendices to Mr. Rendel's report, which Mr. Robert Stephenson insists upon as the true principle, and which he is aware ought to be adopted as the basis of anything like a system that ought to be followed in a river like the river Tyne, knowing also as he does full well that Mr. Brooks has never troubled himself to look to those reports, or at all events thought proper to adopt them in practice, or able or willing to show them, nor has he ever thought

proper to afford the Commissioners the information which would have enabled them to judge for themselves upon the point. *Mr. Webster.*

The principle of river treatment, based upon the observation of Mr. Robert Stephenson and Mr. Rendel, and the other evidence before you, is this, that you should make longitudinal training walls, that you should dredge only as far as is necessary to remove the hard places upon which the water itself will not act, that you should increase the capacity of your channel by placing that dredged material behind your half-tide training wall, and then that you should leave the current to do the rest. That is the simple principle enunciated in Mr. Rennie's and Mr. Rendel's reports; and which is known to have been practised upon the Ribble and in other numerous instances, on the Ribble and on the Severn, by Mr. Walker upon the Tay and the Clyde. That has been the simple principle which the minority has contended for, and which is consistent with the engineering evidence adduced before you, or with the documents rather, because it is more documentary evidence than oral evidence; that was the principle followed by Mr. Telford in the Nene, and subsequently by Sir John Rennie in the Nene, and which has been recently followed by Mr. Stephenson in the Ouse, and also by Mr. Walker in the Welland, in the report on that river, which has been referred to, as well as on the Clyde, and it is now for the first time that any river has been subjected to be treated in the way, or rather to be treated without any reference to principles of that kind in the manner in which Mr. Brooks has treated the Tyne, and in which he has been consistently supported, I must say, by what I will call the conservative landowning interest, notwithstanding the sneer of my learned friend in speaking on that subject, on the banks of the Tyne. 10th March 1855.

I was a little surprised at my learned friend the Recorder, in his summing up the other day, commenting in the way he did on the observation of Mr. Rendel's, in reply to a question (4042). He seemed to insinuate that Mr. Rendel had embarked upon a subject which his question had not called for. If you read the question simply, I think perhaps the observation of my learned friend the Recorder was right, but there is a good deal in the way in which questions are put, in connexion with what had been put before, and what is passing upon the occasion, and you will remember that this is something not unlike that other question which the Recorder put to Mr. Rendel as to his evidence in 1849, as to the part of the river on which the works should be first begun, and which he supposed was, to a certain extent, inconsistent with the statement which Mr. Rendel has given in his report. Mr. Rendel gave two answers to that, both of which were true. In the first place he said, "that answer had reference to some previous examination by the Committee; "secondly, I had not then completed the observations which I considered essential before I "could make my final report upon the matter." But, Sir, it is quite out of the question,—although Mr. Brunel seemed to think that in some of the questions I put I was endeavouring to get a contradiction from the engineers, than which nothing was ever further from my intention,—I say it is impossible that it can fail to occur frequently, from the manner in which questions are put by Counsel, who are imperfectly acquainted with the subject, that there may be upon the evidence sometimes an apparent contradiction. My learned friend the Recorder having commented upon that, upon which I shall not waste any more time, comments upon this answer of Mr. Rendel's, which had reference to several questions before. The question is, "You said that you possibly might have a deep channel Question 4042.
"between Shields and Newcastle, and no sea entrance. In your opinion can Newcastle
"be in a good condition when Shields is in a bad one, as far as navigation goes?" The question involved was mixed up with a great number of matters with reference to what had gone before. Mr. Rendel said—"No; but I think, as I have said before, that it is a
"marvel that with all the ability for business of north-country gentlemen, there should
"be this eternal war between them, simply because they live at the two ends of the river.
"Since you have broached that subject, it really seems to me that neither party is fit to
"have charge of it. I think it is the most extraordinary thing that a river second to
"few in commercial consequence," he might have said second to none, "should for so
"many years remain unimproved, from the circumstance that those so deeply interested
"cannot agree amongst themselves to accept the plans of a competent professional
"adviser. You cannot improve the river at Newcastle without advancing the interests of Question 4043.
"Shields." "Advancing the interests of Shields," mark the ambiguity of that. "And
"you cannot improve Shields without advancing the interests of Newcastle, but such
"unfortunately is the crook which has got into all parties down there, that you never will
"go straight to the object of the general improvement." My learned friend the Recorder read this and commented upon it, and in reference to one of the allegations in our memorial, that there was no competent professional adviser, intimated that such was not the fact. Why, what is the fact? Who is at this moment responsible for the Tyne, I should like to know? Who is he, except Mr. Brooks and Mr. Clayton, because Mr. Clayton is really the Conservator of the Tyne. Mr. Clayton and that holy band of martyrs, the Corporation of Newcastle, are the Conservators of the Tyne. What have those Conservators done? How have they gone to work? It has suited their purpose to keep Mr. Brooks as general Conservancy engineer. Sometimes he is to do this or that. Sometimes he is to be engineer of the piers, and sometimes he is not to be. What is Mr. Brooks' position? Why, Sir, he is not a free agent; he is to do, in point of fact, what the Commissioners, or rather Mr. Clayton and the Corporation of Newcastle, bid him to do. What have they done about other works? They found Sir William Cubitt's views best suited the coal owning interests, and they made him engineer of the Hay Hole Docks.

Mr. Webster.

10th March 1855.

(*Mr. Seymour.*) That is not the fact.

(*Mr. Webster.*) At all events Sir William Cubitt was found to be the supporter in Parliament of those docks, Mr. Rendel having up to that time been engineer of those docks; but his report not having suited their views, Mr. Plews was imported from Cardiff, where he had had experience in the construction of docks for the Marquis of Bute, whom my friend Mr. Clayton represents so ably as regards his property in various places; therefore you have Mr. Plews in charge of one work. As to the piers, a question that was in no respect understood by the general body of the Commissioners, but which was worked by a select committee, from which Captain Linskill was excluded on the opposition of Mr. Philipson, Mr. Brooks ascertains, or Mr. Clayton ascertains, that probably Mr. Walker's views might suit the views of the Commissioners, because you will find that the Commissioners adopted their own plan for the piers in the first instance; it was the Commissioners' plan which was deposited in Parliament, and not the plan of any engineer, being contrary to the advice of Mr. Brooks. Is it not in that state of things, as Mr. Rendel says, true to the very letter, that they will not agree among themselves, "to accept the plans of a competent "professional adviser?" Is there any single engineer, from Mr. Rennie's time to the present who has been responsible for the Tyne as a whole? Has it not been from the beginning to the end under the control of local parties, who are either their own engineers or who consult and adopt, as it suits their purpose, the views of amateur engineers, such as Mr. Taylor, who gave us that beautiful theory about river water, and making his enormous receptacle above Newcastle, and Mr. Mather, who writes from the banks of the Tyne about the state of the river. Is not the state of things upon the river Tyne this: that there never has been any competent professional adviser responsible for the whole of the Tyne, who has been allowed to do more than Mr. Rennie and Mr. Rendel, namely, make elaborate reports which were not acted on. You had upon your table the correspondence, printed by order of Parliament, with respect to the state of the piers at the entrance of the Tyne. Is the state of things, as disclosed by that correspondence, a state of things that ought to be allowed to continue? Is not, if you had nothing more before you, the fact of a loss of two years, frittered away as they have been, indicative of a state of things that ought not to be allowed to continue.

Questions 1042–5.

Then, Sir, was this allegation contained in the letter of the majority in answer to an allegation in the memorial of the minority true? "The fact is, that the majority "of the Commissioners have repudiated the quackery of the amateur engineers, and have "acted upon the opinion of the first engineers of the day?" Are the first engineers of the day Mr. Brooks, Mr. Taylor, and Mr. Mather? Is that true or is it not true, as alleged in reply of the minority, that so far from having acted upon the opinions of the first engineers of the day, there is no consulting engineer responsible for the encroachments which the Commissioners are carrying out, Mr. Walker's responsibility as consulting engineer being confined to the piers? I say that Mr. Rendel's observation was literally true, and that the local parties cannot agree to accept the plans of a competent professional adviser. They treated him as they did Mr. Rennie, they used him for their own purposes when they wanted to defeat the Conservancy Bills, and having obtained a most elaborate series of documents, at a cost of some thousands of pounds, and some three years' labour, probably the most detailed and elaborate that any engineer ever gave to such a subject, they do nothing with them but put them into their box, where they would have been found at the present moment but for the energetic proceedings of this minority, who were determined to have the whole matter brought out if possible before the public.

Appendix, page 8.

Sir, we have had a great deal said on the subject of the Admiralty, but I think that when you have looked at the correspondence which is now before you, which is not a private document, not secret, like the correspondence with Mr. Walker, part of which was printed and the other part not, but which I presume is now withdrawn, you will be pretty well of opinion that the Admiralty have been most useful in the case of the Tyne as regards the piers, and that if they had not taken the decided and determined course they have done, we should have had the piers tinkered, and the whole question tinkered and dealt with pretty much in the same way as other matters have been done in the Tyne.

The following paragraph was censured by my learned friend the Recorder, contained in the letter of the minority of the 3d of August:—"We do not deny that by means of "steam, vessels can navigate with somewhat greater draught of water the violently con-"tracted channels caused by the jetties; but we maintain that the navigable capacity "(depth and breadth combined) has very much deteriorated. The dredger has very lately "been employed in endeavouring to restore the sailing track through a new shoal, which "has sprung up directly opposite Messrs. Palmer's encroachment, where the rising of the "bed of the river has followed the extensive embanking of both sides, and its contraction "to less than two thirds of its original width." Is that true or not, Sir? You have this proved unquestionably, so far as regards this allegation made in August as to shoaling opposite Palmer's enclosure, that the dredger was at work there for five weeks during last summer, and that notwithstanding Mr. Brooks' promises as regards the jetties, and as regards the absence of any necessity for dredging, that the maintenance of that channel is due, whatever may be its precise width or depth now is not very material, to dredging alone. A new shoal sprung up, call it by what name you will, although Mr. Straker and some other witnesses were not very precise upon it; there was a new shoal existing in consequence of these encroachments.

Mr. Webster.

10th March 1855.

It was necessary for me, in consequence of the strong observations of my learned friend the Recorder, at Newcastle, saying that there was no truth in the allegation, to show that the minority had not made statements which they could not substantially support.

The question of the improvement of the estuary as distinct from the navigation up to Newcastle, as I have said before, really involves the question of the elevation of the high-water surface, and the increase of the tidal volume. This has been found to be diminished both by the calculations of Mr. Heppel and Mr. Calver. If Mr. Calver is right, really the low-water capacity has not increased, and the depression in the low-water surface is referable to and indicates the introduction of less tidal volume, because it cannot be referable to any other matter. But I apprehend that you will be of opinion that the evidence of the capacities, as furnished both by Mr. Heppel and Mr. Calver, point really to an abstraction which the jetties produce, by abstracting the tidal momentum, and to the diminished capacity as evinced both at the bar and at Shields harbour. Mr. Brooks has insisted in his evidence upon what he calls this depression of the low-water surface. How did he prove it in the first instance? Why, he called Mr. Dunn, a wharfinger, who said that going over Gateshead Bridge on one or more occasions, he saw more of the piers of the High Level bridge than he did before, or on other occasions. Why, really, Sir, it was rather a farce to bring such a witness on a question which if proved at all could be only proved by careful and elaborate tidal observations. Mr. Brooks promised documents to support this; those were asked for with a pertinacity which few persons would have followed up excepting Mr. Stevenson, in his anxiety to obtain the truth; and although Mr. Brooks promised these documents over and over again, you will find at page 175 what took place upon inquiring for those documents, and which were asked for again upon a subsequent occasion; it was not till the last meeting that those tidal diagrams were produced. What are those tidal diagrams, which, as Mr. Brunel said, are a class of evidence the most important of anything which had been given? Mr. Brooks produced nine selected tides between the intervals of September and October, a period of the year when the tides are generally unusually good, and also a very dry season; you remember what Mr. Comrie said upon that point, that there was hardly a drop of rain during the time they were making their observations. Question 1896. You remember Mr. Brunel put some pertinent questions to Mr. Brooks, who thought there had been some interference by freshes with some of the observations; in fact it stands upon his evidence that he did not know exactly how that was, but it stands on the evidence as notorious that the last was a remarkably dry season. We may, therefore, assume that those nine selected tides were not bad tides for Mr. Brooks' view of the case. What do they show? That the high water at Newcastle is $1\frac{1}{9}$ inch lower than at Shields; that the difference of time between high water at Shields and Newcastle is on the average 58 minutes; there is one 45 minutes, and another an hour and a quarter, 75 minutes. Of course taking the average is the only way we can deal with it; therefore, the conclusion to be drawn from these selected tides of Mr. Brooks, as regards the interval, which is a material ingredient in considering the question of the state of the estuary, shows a difference of 58 minutes later at Newcastle than at Shields. You have nine selected tides for a month, from the 7th of September to the 6th of October; then you have some selected tidal observations in 1849, for a period of three months. What do they show? You have a period of ten tides during three months in 1849, which have been called Comrie's tides; they show high-water to be $1\frac{1}{2}$ inch higher at Newcastle than at Shields, and the average interval to be 59 minutes, so that there is a gain of one minute upon that average of Mr. Brooks' selected tides against those of Mr. Comrie, but a loss as regards the height of high water. Now go to 1813, that is very material; a series of 34 tides out of three months shows the high water at Newcastle to be $3\frac{1}{7}$ inches higher than at Shields, and the difference of time to be 49 minutes, so that there has been a positive loss from 1813 to 1854 of two inches, and a positive loss in time of 11 minutes between the two.

Now, Sir, I do not mean to say that these matters are to be pressed too far, but the evidence furnished by ten tides in 1813, in May and June, show an interval of only 48 minutes. And so far as they furnish any evidence at all, they are conclusively against the system that has been practised by Mr. Brooks in the Tyne, because, judging from that, there is both a loss of water and a loss of time. What does Mr. Rendel say upon that point? He was asked some questions upon it, and he says, "I found by the survey of Questions 4351-52. "Comrie, in 1849, that the spring tides did not rise at Newcastle to the same height in "level as at the Low Lights by, I think, about 5 inches, Rennie having reported, or Giles "having stated upon his plan that the spring tides uninfluenced by wind flowed level "throughout the whole length of the river to Newcastle quays. So that in the interval "between 1813 and 1849 there had been a less flow at Newcastle as compared with the "Low Lights to the extent of 5 inches, supposing both the surveys at these dates to be "correct." Thus you see that Mr. Rendel's conclusion from those facts, so far as they are to be used, was, that from the evidence derived from the tidal flow, there had been this loss, or rather this deterioration, in the channel.

Another allegation has been commented upon by my learned friend, which is contained in the memorial of the minority. The words are, "the encroachments are becoming "every day more apparent." You will remember that although we could get no precise information from Mr. Brooks, in the nature of returns upon this point, Captain Purdo having been anxious to have the state of things already disclosed as regards the rate of encroachment from 1840 up to the present time, yet we have some evidence that it is not

Mr. Webster.

10th March 1855.

unimportant to be observed upon. Mr. Calver has told you, and Mr. Brooks has stated the same thing, that in the 36 years, that is, in the interval between 1813 and 1849, there had been an encroachment of 95 acres, which is something less than at the rate of 3 acres a year, but in the next 5 years there has been an encroachment of 35 acres, which is an encroachment at the rate of 7 acres a year. The increasing rapidity with which the encroachments were made, was a fact which was notorious, although the precise quantity was not known to gentlemen passing up and down the Tyne; they knew from about the time when the old Corporation found it necessary to set their house in order; at that time, and from that time downwards, there had been a considerable activity going on in the rate of encroachments compared with the preceding time. That was one matter upon which they were anxious to obtain information, and upon which they have hitherto failed. I asked Mr. Clayton for some information about the licences that had been granted; some information of that kind was to be furnished, it is not very material, but I believe it would disclose some curious facts as to the different parties to whom and the time when licences had been granted; that information has not been furnished, but sufficient appears from another document, to which I shall call your attention hereafter, sufficient for my purpose of pointing out what is the nature of the controlling influences by which this Conservancy has hitherto been managed.

I shall not pursue Mr. Brooks, as my learned friend the Recorder did not pursue the subject, either into the discussion which has taken place about the actual state of the bar, or the actual state of the sea channels; that is a matter which I have already referred to as a question which will vary very much from causes wholly different from the question of works. But I think you will be satisfied from what has already taken place, and from what Mr. Rendel pointed out to you, and from your own inspection of the sections, that the actual capacity of the bar and of the Narrows at present is less than it was, and that there is now in connexion with the encroachments that have taken place in the upper parts of the river less water actually going in over the bar than there was in Mr. Rennie's time, or at all events, than there was at the time when the bar was in the same state as at present.

One answer that Mr. Rendel gave upon this point will be sufficient for my purpose; being asked, in reference to the question about the comparative state of things at Newcastle and Shields, which gave rise to the observation of the learned Recorder, upon which I have already commented,—"Is it possible that you might have a good state of navigation up to "Newcastle, and a bad state of bar at Shields?" he says, "That would be possible; "you might have a very good deep channel up to Newcastle, and a very small quantity of "water passing in and out over the bar, and in my judgment, as a consequence, a bad "condition of bar and sea entrance. To that extent, so far as regards the question of the "state of the bar and the entrance to Shields harbour, and the question of the navigation "up to Newcastle, they are distinct cases in that respect. The works which had gone on "upon the Tyne up to the extent to which they had gone in 1849, had injured the sailing "channel, but had in some parts benefited it." That goes to the question I have already referred to of the low-water capacity, because those sections which have been furnished, so far as Mr. Heppel's operations are concerned, support that view. Then Mr. Rendel goes into the calculation as to what was the greatest amount of water you could possibly have if you improved the river to the utmost limit, and he says, "You cannot afford, at all events "it would be the height of engineering presumption to make so large an abstraction from "the Tyne before you had ascertained by works at the bar that you could afford to lose "such a large proportion of the tidal back-water." The question therefore, in reference to the estuary and the bar, comes to this: What is the limit to which you can venture to go, and what are the true principles by which you must be guided in a case of this kind? and I apprehend I have done sufficiently already in calling your attention upon that point to what Mr. Stephenson said respecting the natural section of the river, and therefore I shall not repeat it. But Mr. Rendel gives some evidence upon this question, which agrees so entirely with what I have already read from Mr. Stephenson's, that I must trouble you with it. I put a question to him respecting Mr. Stephenson's evidence; it had been supposed that I was about to show some discrepancy between the two, and the answer is this: "I should agree with Mr. Stephenson that the tidal area might be reduced to such "an extent, that you would have a less flow of necessity at Newcastle." Then he is asked, "You have spoken of approving generally of the principle of cutting off bulbs on the "river, as increasing the momentum?" and he replies, "Yes, whenever you cut off a "bulb of the kind referred to, you unquestionably increase the momentum, but there must "be a limit to the cutting off of bulbs when the loss of tidal water becomes so great, that "that which remains is incapable of performing the work which it has to do at the "harbour's mouth. As I have said before, if you could by possibility have the necessary "tidal receptacle above Newcastle, that you might do as you liked with the form of the "estuary below Newcastle, and so give it the best possible form for navigation up to that "town. But you must have the necessary receptacle somewhere, and in this case it must "be between Shields and Newcastle." Then he is asked a question about the abstraction of Jarrow Slake, and he says, "I believe the taking off such shallow tidal creeks would "have the effect, if done with judgment, of sending the quantity of water further up "the river, and thereby increase the tidal column. That there is room for such increase "of rise is shown by the fact, that according to Comrie's observations in 1851, the tides at "Newcastle did not rise to the same level as at Shields. Thus there would be no loss of "tidal water until the tide rose to its proper level in the higher parts of the river. That end

Questions 4380-82.

Question 4383.

Question 4354.

Question 4357.

" attained, there should be no further reduction in the tidal receptacle until the effect of the " works at the harbour's mouth had been fully ascertained." Then again, " You might more " than fill the river up to Newcastle. You might get it to run at a higher level at Newcastle " than it attained at the Low Lights; to what extent you could make the tide at New- " castle rise above its level at the Low Lights, becomes a most complicated question, even " if all the conditions for its investigation were given. It might be possible to get a rise " of 18 inches on that distance, with wind and tide favourable. Every dealing with the " tidal area in the nature of abstraction at one part, does not necessarily produce a heaping " up of the water in the channel?" And in reply to the question " Then where does the " water go to?" he says, " It does not necessarily go into the estuary at all. Assuming " that the same quantity of water passes into a small reservoir as passes into a large one, " the surface of the water will of course be higher in the small reservoir than in the " large one. As applied to this case, the tide would rise higher in level." Then he goes on, " That will necessarily be accompanied with an increased reflex action at the minimum " section; and if that is carried beyond a certain extent, it will diminish the quantity of " water coming in through that section; the necessary tendency of any heaping up above, " consequent upon a reduction of the tidal area, to produce a reflex action. The slope of " the surface may be so increased, that from the reflex action you have less water through " the minimum section." That evidence indicates exactly what Mr. Stephenson had indicated in his evidence, which I will not again trouble you with, what are the true considerations in a matter of this kind, and show a perfect agreement in principle between those gentlemen. You will remember in answer to questions which I put to Mr. Stephenson, he said that the opinions he had given as to the water at Jarrow Slake, for instance,—the point to which his attention had been principally directed in the case, because he gave evidence upon it,—were based upon the assumption that the same quantity of water would come in through the minimum section. What then is the limit of this? to what extent will you go? Have you not already gone to an extent which must make it very dangerous to go further? Dare you go any further except upon most careful consideration? Has not the sanction already given to the Hay Hole docks, to the docks in Jarrow Slake, to say nothing of those other encroachments without any authority, and without probably any consideration of the consequences, by reason of these full-tide jetties of Mr. Brooks, and the solid land made or in progress, so diminished the tidal receptacle as regards the tidal capacity, that you may reasonably think that the limit has been already exceeded, and that the result of those works must necessarily be the admission of less water into the Tyne, whatever may be the improvement upon the navigation in making the river better up to Newcastle, and serious danger to the entrances. If that be so, are there not reasonable grounds for fear, that the consequence will be a necessarily constant, permanent deterioration of the bar and the sea channels, a deterioration which will go on accumulating from year to year, till they become hopelessly worse, instead of becoming better and better. That is the real question, about which the minority, who have had no interest in the world to serve except the general interest of all, shipowners' interest, and the interests of the port, are so anxious. The minority say the principles disclosed by those gentlemen are well understood, and those which they perfectly agree in; but looking at the way in which the Tyne has been dealt with, the works that have been executed, and are in process of execution, and are projected, if Mr. Brooks is allowed to go on, or rather the present Conservators are allowed to go on in the way in which they are, it must necessarily lead to such a heaping up; it comes to that, because the removal of all water from the side of the river must lead to the heaping up of water in the channel, that the limit has been already obtained, and that even at the present moment it cannot but be the result, that you have less water coming in through the Narrows than you had before.

Mr. Webster.

10th March 1855.

Question 4357.

Question 4360.

Questions 4365-69.

Questions 4126, 4194.

I need only refer you to the evidence which Mr. Walker gave upon this point, which presents it in a strong point of view, but which, although it is presented in a strong point of view, is nevertheless true and consistent with the other evidence. You remember, Sir, that I asked Mr. Walker one or two questions. I asked him as few as I thought it consistent with my duty to do. I asked him, in reference to the opinion he had already expressed in the House of Lords, with reference to Jarrow Slake, in substance as follows: Assuming the water to be excluded from Jarrow Slake, what would be the extent of the elevation of water up to Newcastle, assuming such water from Jarrow Slake would be placed in the bed of the river from that point up to Newcastle, that is, assuming the same amount of water would come in through the minimum section? also to what extent the water may be raised up to Newcastle by reason of cutting off these diversions in Jarrow Slake and other places, that is, having reduced the river according to lines such as Mr. Brooks had shown him, and assuming the water so excluded went up the river, how much it would raise the level? He replies—" I should say (but their Lordships should " know that it is a speculation) a foot above its present level, supposing the river to be " regulated for its whole length upwards; and I may also add that to compensate for the " whole quantity taken from Jarrow Slake, if you exclude that it will require the water " at Newcastle to be raised ten feet." He says in reference to that, " That seems " enormous when I look at it now, but I have considered this a good deal, and I know " what the effect of improving the Clyde has been as to raising the water, and I do not " believe that the Tyne at Newcastle will be raised more than or so much as a foot by " any improvement which can be made."

Question 4549.

You will remember that Mr. Rendel had stated that he thought the water might be

Mr. Webster.

10th March 1855.

raised a foot and a half at Newcastle; that is to say, improve the river as much as you will, the utmost elevation of tide that you will get, the increased height, will be eighteen inches. Mr. Walker speaks from his experience in the Clyde; Mr. Rendel speaks of his general experience in other places, and what is more material, upon these most elaborate calculations which have occupied his attention for three years. If that be so, what is to become of all the water that has been excluded, and that will be excluded from those places? Why it will never enter the Tyne at all, and therefore you have, if you are to place credit upon the testimony of those gentlemen, Mr. Walker now being the engineer of the Conservators—because one good effect of your proceedings here has been to restore him, Mr. Brooks, and the Commissioners to the state of a happy family again—Mr. Walker is again the engineer for the piers, though not the engineer for the Tyne generally; upon their testimony, and upon his opinion as to the improvement of the river Tyne, that you will not get more than a foot, and, according to Mr. Rendel, more than eighteen inches up to Newcastle; in which, probably, from your experience you would be pretty much disposed to concur. Looking at the relative levels of the two places, the bar and Newcastle, because as regards a question of that kind, as to the disposition of the water of Jarrow Slake, that is a matter of the simplest calculation; you have an area of 360 acres, and a depth of five or six feet; you can tell at once how much the water in a channel of 600 feet wide on the average, and eight or nine miles in length, will be raised at its surface, supposing the water to be placed in the channel, which it must be if it enters the Tyne at all; therefore it is clear that if the receptacle is to be dealt with in the way in which it has been, and is contemplated to be dealt with, you have already far exceeded the limit which you can possibly do without detracting from the quantity of water which comes in from the sea, passing through what was called the minimum section in Mr. Robert Stephenson's evidence.

But, Sir, that is not quite all. Mr. Walker pointed out to you the position of this water, as a question affecting the bar, that the situation and distance from the bar were also material; that is a matter, of course, important in considering to what extent you may venture to allow operations of this kind to go on; and it comes to this, that you ought not to allow a river of this kind to be dealt with or treated except as a whole, and after the most careful consideration of the most experienced men, upon plans, as a whole, that have also received the most mature consideration. I am sure there is not a gentleman round this table, who can say that is the way in which the Tyne has been treated. I do not deny that the Hay Hole docks received the experience of Sir William Cubitt; you have heard a little about that, in what respects they differed from Mr. Rendel's plan, and Mr. Brooks was on the point of suggesting, and, if Mr. Brunel had not checked him, would have said that really these Hay Hole docks may be regarded as not excluding any considerable amount of water, and that they might be worked so as to leave the water available for the bar. The Jarrow docks are under the control of Mr. Harrison, the engineer, and the Admiralty; that is a matter belonging wholly to the railway company. I do not deny that the Conservators have done well in restoring Mr. Walker, the engineer to the piers, but the inner works have never received his consideration as engineer, which they ought to have done; and if Mr. Walker be right in the evidence he has given as to the necessity of not diminishing this receptacle, and if he be right in his views that the quantity of water which comes in through the piers is a question of the receptacle to be filled, that is to say, first, its area, and, secondly, its position, and, thirdly, its relative levels with reference to the tide outside, the inner works now going on in the Tyne ought to be stopped to-morrow. You cannot escape from that conclusion; what has gone on, and is going on, is diminishing the receptacle, and is changing its position. You remember the questions Mr. Brunel put to Mr. Walker about particular places and the tidal area opposite Hebburn Quay, and at other places; he says, in effect,—"That is part of the estuary, this water "ought not to be excluded from it; it was a matter of importance." If Mr. Walker is right in his views (when he prays that the receptacle may not be diminished, and the Conservators cannot say he is wrong, having placed him in so responsible a position), those encroachments in the Tyne ought to be stopped immediately, and the Tyne should be placed under the superintendence of some persons of competent experience, who may have independence enough to control the proceedings of local parties, and take care that the river is treated, as a whole, under one proper and comprehensive system.

I have said all that I think necessary upon the question of transverse jetties, and I assume for the present moment that you, as everybody else has done excepting Mr. Brooks and the Conservators, condemn the full-tide transverse jetties, and upon that assumption I will direct your attention to a few observations upon the next question, as between full and half tide walls, which has already occupied your attention.

Now that is partly a navigation and partly a landowners' question. Looking to the navigation question, it involves directly the question of the exclusion of water, but it also involves the effect on the current, as regards the amount of water that may be passed up, and the abstraction which a certain head outside will experience in passing the water to the higher reaches. The object of both the full and half tide walls as a navigation question is the same, namely, the training of the channel in such a course that there may be a true channel for the flood and ebb, that they should pass over the same channel, and that therefore there should be no expenditure or loss of scouring power; but they present a great number of features of difference which will require attentive consideration. I have already reminded you that what Mr. Rennie recommended, except in certain places, was half-tide

Mr. Webster.

10th March 1855.

walls; that has been doubted by no person excepting by Mr. Brooks or some of those who employ him in the present Conservancy. I have already read the paragraph in Mr. Rennie's report, which is conclusive to my mind, upon that being his intention, and I have called attention to the paragraph at the commencement of his report, where he says that solid embankments ought not to be allowed, except in special cases. There is one other paragraph in his report which bears upon this question, to which I must also call your attention, as recognizing a clear distinction between what I will call the rights of the river and the rights of the land, or the interest of shipowners and the interest of the landowners. Having referred in the introductory part to the necessity of limiting solid embankments, he says, "The narrowing "of the river by means of jetties is the most economical mode I can devise, and best suited "to the circumstances of the case, for that part of the river which lies between Shields "and Newcastle; but for the whole length of Shields and most of Newcastle I am of "opinion the contraction should be made by regular wharf walls of masonry, and as the "space gained will prove highly beneficial to the proprietors of property bordering on the "river, I cannot for a moment doubt that they will be ready to make an allowance for the "ground gained, if not to undertake the work at their own expense." And further, at the end of his report, he says, "But as I have before given it as my opinion that the stone "walls or wharfing in South and North Shields should be done in part if not wholly at "the expense of the respective proprietors opposite whose property the new wharf walls "are to be made (the earth or sand to fill the spaces between the wharf walls and the land "should be provided at the expense of the Harbour and Navigation Fund, because the "removal of the sand is necessary to give depth of water in the river), this would occasion "a saving of upwards of 80,000*l.*, and would reduce the estimate to 439,320*l.*"

I call your attention to these paragraphs as fortifying the observations I have before made, upon the clear distinction which Mr. Rennie drew between the treatment of what we call the channel of the river, so as to reduce its area to about 880 acres, by half-tide training walls, and those places where you were to have solid wharf walls or embankments or quays, which were to add value to the property of the landowners. I think you must be satisfied that such views would not have suited the interests of the Corporation of Newcastle, who were then the Conservators in the land on the foreshores of the Tyne; you were told that they objected to his report, but its non-adoption in operation has not been put on that ground, that I am aware of. You have been told by Mr. Stevenson and others, that one of the objections made to his report was the south pier, which had been made the excuse for departing from his general system of river management, though Mr. Rennie himself, as appears by his report, was quite aware of the objection, as causing the sea to range into the harbour, and contemplated measures for its prevention. And I think you will agree with Mr. Stevenson, that this is a paltry excuse for neglecting to attempt works for the improvement of the bar and river generally. The disregard and neglect of Mr. Rennie's report, and of the plan and practice in substance which he recommended, has been so much complained of as against the Corporation, the late Conservators, and also against the present Conservators, the minority having uniformly insisted upon the adherence to those principles, and endeavoured to secure their adoption in practice, that my learned friend the Recorder actually called Mr. Clayton to give an excuse, so far as he could, why the Corporation, the former Conservators, should not have carried out Mr. Rennie's report, and this is rather a remarkable piece of history, a novelty introduced into this case for the first time. He is asked, "Do you know where his river lines "were put upon the plan"? Mr. Clayton replies, "In London, Mr. Rennie of course "drew his information from the plan, and the plan would give him the information more "effectually than an inspection of the river, no doubt, but he had no opportunity of "having any knowledge of the manufacturing establishments existing on the banks of the "river, and I think in his report he qualifies his lines accordingly. The survey was in "1813. He made his report in 1816." It is, Sir, I must say, rather curious that it should now for the first time have been thought necessary to give that sort of excuse for the complaints that had been made against the non-adherence to Mr. Rennie's report, or at all events not carrying it out, as far as practicable; and I have no doubt that the Conservators thought that when first started, and may now think it a very good excuse. Have they ever assigned such a reason before? was ignorance of the manufacturing establishments upon the Tyne an excuse for doing nothing under Mr. Rendel's report? the substance of one of the charges which the minority have now made against them is, that although they obtained Mr. Rendel's report at an immense cost, no use has been made of it, and nothing has been done upon it; and, Sir, you have not had a shadow of suggestion, either from witnesses, or from my learned friend, why they have not followed or attempted to follow out to some extent the report which Mr. Rendel gave them. They could not allege ignorance of the manufacturing establishments against Mr. Rendel, at all events.

Question 1378.

Question 3284.

Question 3285.

I do not know, Sir, whether your attention has been called to a very interesting and important document, as affording information upon this subject of the manufacturing establishments, being Appendix 14 to Mr. Rendel's report; if not, I should pray that you would look at it. It purports to be an account of all the various establishments upon the banks of the Tyne, as the title of it shows; it contains a plan of all the works up and down the Tyne, with the number of them, containing the names of the owners and occupiers, the state of the works, and a good deal of other information of rather a curious nature, but most instructive to persons interested in or entrusted with these conservancy questions, with reference to the state of the quays, the encroachments, the dilapidations, and the pro-

Mr. Webster.

10th March 1855.

tection to the places of deposit for the ballast, or the ballast banks. It is called "A "Survey for the use of Mr. Rendel, for his use in determining to what extent, if any, "the proposed half-tide walls for the improvement of the river would affect the property, "and to guide him in determining the works generally." I now call your attention to that as one of the documents which show the extraordinary pains Mr. Rendel took to inform himself upon every possible point in this matter, before I go to the evidence I shall call your attention to immediately, as to the propriety of the plan he had recommended about half-tide walls.

Mr. Clayton having given that kind of account or excuse upon the subject of their not having adhered to Mr. Rennie's plans, Mr. Philipson is also asked a question upon the same matter; Mr. Clayton had said previously, that "the Corporation happened to "have considerable property of their own, and they commenced operations in front of "that property; a good deal of it was let on leases, and they have had very serious "claims for compensation on the part of their lessees, and also on the part of other "persons, to deal with." Mr. Philipson follows the cue of Mr. Clayton's evidence. Mr. Philipson is a solicitor, and a very extensive coalowner, and a gentleman of great talent and experience, and extensive connexions, and has been a witness in opposition to the Shields gentlemen upon every Inquiry that has taken place, either Admiralty,

Question 3876.

Parliamentary, or otherwise; and he gives this very extraordinary account with reference to the question of encroachments of land. He is asked, "Do you agree in the evidence "given to-day by the Chairman and the Town Clerk, Mr. Clayton, that the Corporation "have suffered as much as they have gained in respect of their river frontage, by the "operations on the river?" A tolerable leading question, but mark the answer: "Most "decidedly I think that the claims which they have had in the shape of compensation, are "fully equal to any value that you can put upon the land, which they have acquired, and "I would say also as a member of the Corporation, that the idea of their establishing or "supporting any enclosure of land for the sake of making anything of it was the last "thing that any member of that body ever entertained; such an idea does not enter the "mind of any one of them; and as a proof of that, the land adjacent to it has been acquired "not so much for the Corporation of Newcastle about Walker and that district, as for "the benefit of those holding leases under the Corporation who have built manufactories "upon it, and who could not, without the grossest injustice, have been deprived of their "river frontage. Had it not been so, the sum that must have been paid as compensation "to those parties would have been enormous, because it was not a mere question of the "value of land, but of manufactories and of buildings which the parties had established "upon it." Why, Sir, this is the first time I ever heard that land acquired for the benefit of lessees under Corporation leases was not, to a certain extent, a benefit to the Corporation themselves. But who are the lessees, and are not beneficial leases one of the best

Question 8933.

devised means for extending Corporation influences? You remember, Sir, that the Corporation have never published their rent roll. I asked Mr. Philipson a question about the area of the land which the Corporation had formed from the river, but he did not know anything at all about that, and yet he undertakes to adopt the extraordinary opinion that the Corporation have derived no benefit therefrom; he had not the least idea about that. But, Sir, what does all this prove? Either that the Corporation must have managed their matters very badly, or at all events that the benefit, great as it must have been, of land made from the river out of river funds, by the deposit of ballast, has been enjoyed by the holders of beneficial leases, while the Corporation as a body have paid the compensation referred to out of the same river fund. Do you believe there would have been such encroachments made upon the river by means of ballast and otherwise, if it had not been a source of profit and influence to the Corporation either directly or indirectly? The individual members of Corporations have very little direct interest in it, but their lessees are deeply interested, and there are others who have more or less of beneficial interest on the Corporation, which gives that species of combination of Newcastle interest and of landowners' interest, which renders it impossible, and must ever render it impossible, that you can have a local conservancy which can adjust matters in the way in which they ought to be adjusted and carried on upon a river like this.

You will remember that my learned friend the Recorder commented upon the fact of my not having called certain other witnesses before you, but who has he called? There were Mr. Clayton, and his brother solicitor, Mr. Philipson, both most eminent men in their way; the Treasurer was to have been called, but was not; he might have told some inconvenient facts about licences and rents and Corporation lessees. Mr. Rayne was actually in the

Page 253.

witness box; he is a member of the Corporation, and Elder Brother of the Newcastle Trinity House, and was actually called as able to give some information about the pilots and the Newcastle Trinity House; but finding that I wished to ask him one or two questions about a denial of some of Captain Purdo's statements, he declined to go into the box, and substituted his younger brother, Mr. Wake. You will remember that Captain Fitzroy wished for some information about the Newcastle Trinity House, and I suggested Mr. Rayne was present. This is only material in answer to the observations of my learned friend, that I had not called witnesses; my learned friend has not called witnesses, many important witnesses he might have called, for instance, the Treasurer and Mr. Rayne, who might have told you if Mr. Philipson's statement was true, that the Corporation derived no benefit from the large quantities of land that they had reclaimed upon the banks of this river; or some of the five other members of the Newcastle Corporation on the Commission, who might have told you whether their lessees had no benefit; and he

Mr. Webster.

10th March 1855.

might have omitted many witnesses called to facts which were never in dispute. These interests present a most material question for your consideration, in determining what is to be done for the future, and in deciding how it is possible for this river to be managed, if that species of influence is to be continued.

Mr. Rendel in his report, which I shall not trouble you with, except one or two paragraphs very shortly hereafter, had given his opinion upon the half-tide walls; he had also recommended a half-tide dock at Hay Hole. In his evidence before you he goes to this question of half-tide training walls and says, "The treatment of the Tyne for conservancy Question 3995.
"purposes ought to be by half-tide training banks, and not by full-tide walls making
"solid land. Furthermore, nothing should induce me to trench on the receptacle of the
"tide in the Tyne, in a manner that would materially diminish its volume. I consider that
"the only grounds upon which its back-water can be justifiably diminished at all is that the
"navigation up to Newcastle cannot, at a justifiable expense, be made good without risk of
"some reduction, and that the same may be said with regard to the remaining existing
"waterside establishments between Shields and Newcastle. The question must here
"again be treated as a compromise between the wants of the existing commercial esta-
"blishments on the river and what is necessary for the maintenance of a good sea entrance.
"If, therefore, you make works up the river for its improvement, without reference to
"the natural difficulties which exist at its entrance, the consequences will be most fatal,
"and hence the necessity of a strict conformity to some well-devised plan for the whole
"river and its entrance, in carrying out any works that may be found necessary to meet
"local commercial wants, and which in such a busy district as the Tyne passes through,
"must be of daily occurrence." "It is my opinion that you should get your navigable Question 3996.
"channel up to Newcastle, with the least possible sacrifice of tidal water, especially
"pending the result of any intended works at the entrance;" and being asked about the interest of frontages and landowners, he says, "My experience is, that when you have to
"deal with a multitude of interested individuals, the only way that you can arrive at a
"speedy result is to be able to say, Gentlemen, this is a matter for the opinion of a jury
"or referees if you and I cannot agree." Then he is referred to openings in his half-tide training walls, and he says, "The object of these openings was two-fold, to give facility of Question 3999.
"access to property situated on the present shores, and to do that in a manner that would
"ensure a gully or deep channel out of the navigable channel between beacon heads.
"The effect of such openings, and the consequent gullies, would be to lessen the tendency
"of the shore to silt up." That, Sir, was the evidence as to half-tide walls, part of which I adverted to before, upon the question which Mr. Brunel had put as to the difference between the encroachments by full and half-tide walls.

On being recalled on a subsequent day, he is asked, "Do you think that, after these Question 4067.
"half-tide training walls have been constructed and in operation for some time, the space
"at the back will remain so deep as it was?" "No, certainly, not 'so deep.'" "I think
"that, generally speaking, it will not silt up to the level of the half-tide wall?" "I think
"the bursting effect of the tide over the wall would always keep it lower than the wall.
"My impression at the time was this, that you might assume that, taking the whole area,
"or rather the whole cubic capacity of the shores outside the channel made between the
"half-tide walls, you might ultimately lose one-third part by silting, not more, because you
"will see by the sections that you have a larger capacity above half-tide along those banks
"than you have below half tide. This ultimate loss would be more than made good by
"the removal of banks between the half-tide walls in the channel." Then Mr. Brunel makes a sketch, showing a triangular wedge as the loss, upon which Mr. Rendel says,
"Your sketch is not a correct diagram of the shores of the Tyne, because it assumes that Question 4070.
"the slope of the shore at high-water mark dies out. Generally speaking, there are cliffs
"and shipping places on both shores, with a considerable rise of tide in front of them. My
"recollection is, that this is more like the form of the shore, and what it would become from
"the proposed half-tide walls (*describing the same*), and more particularly as these openings
"proposed to be left in them would not only give the requisite facilities for vessels to get
"to the wharfs, which would be cut off by whole-tide walls, but would also promote
"a scour along the shore, and cause such a stream at the opening as would make and
"maintain a good channel up to the wharfs. I do not think there are any appearances in
"the Tyne to bear out the supposition you put." Then he is asked whether any material trade can be carried on? He says he thinks it could, "that along the Flintshire shore of Question 4072.
"the river Dee, very long channels of this kind are maintained across half-tide banks much
"less favourably circumstanced, and other instances may be adduced. The ebb stream
"of tide flowing off half-tide banks is the sole agent, in many harbours, of maintaining
"deep channels or gutways between such half-tide banks. Cases of that sort will be familiar
"to you. Here the half-tide wall would assist by confining the scour."

I may mention that in Mr. Walker's report upon the Tay, and in many other reports, you will find similar instances as to the effect of the wash of estuaries in maintaining the banks at or below the level of half tide, and that they do not grow up higher. The only answer that has been attempted upon the part of the majority is suggesting that a half-tide bank would grow up into a full-tide bank. That is unsupported by a single fact upon the Tyne, and is contrary to the experience of what has been going on in Jarrow Slake, which had been kept entirely open, and it is contrary to the experience of Mr. Straker, Mr. Poppelwell, and other gentlemen acquainted with the Tyne, who are quite competent to have a decided opinion upon a question of this kind.

Mr. Webster.

10th March 1855.

Page 323.

On another important question Mr. Rendel says, "The equalizing of the duration of the "flood and ebb tide would be nearly as well established by half-tide as by whole-tide "walls. Again, as regards silting, all experience shows there is even less silting at the "foot of half-tide than of whole-tide walls, particularly in a curved channel. Then we "come back to the question, how is the requisite tidal receptacle to be increased, and "the navigable channel up to Newcastle improved at a reasonable cost? To do so by "widening it, so as to retain the whole-tide walls, would be to diminish the current, "particularly of land floods, on the good of which so much stress has been laid, and allow "it to form a winding course, and, consequently, to give rise to banks and loss of back "water. If this be so, half-tide walls, with the proper width of channel between them, "seem the obvious remedy, for here we have a certainty of retaining the necessary area "for tide water, and that in a manner which will be likely to be nearly permanent, the "half-tide walls tending rather to cause a deepening on each side of them, though some "shallowing between them and the shores, as may be seen in that class of harbours "having large tracts of half-tide banks or slopelands on either side of them; instance the "case with Wells harbour, which is a striking example of how the running off of water "from half-tide banks promotes the maintenance of the depths of channels between them. "Portsmouth harbour is another instance, where you have deep channels between slope-"lands or banks, which are seen at about half ebb. Such walls are as effectual as whole-"tide walls for applying the power of land floods to the scour of the channel. Also at and "during neap tides they are just as effectual." He then goes to another question, but I will read the whole of it now to dispose of it. "But it is said that whole-tide walls "propagate momentum of the ascending tide more than half-tide walls; granted; but the "question is, to what extent, and what would be the value of such increased momentum in "additional tidal column up to Newcastle. Judging from the Dee and the Clyde, I fear "it would not be much. But as a question of practical engineering (and really this is "the view which I took of it at the time), I am prepared to attach the greatest importance "to the circumstance that it is more prudent, as well as more economical, to try the effect "of half-tide walls first, even though whole-tide ones should be ultimately carried out; "because the results they will develop will doubtless guide the engineer in his future "operations, and will be so much done towards the end to be attained, if that should be "whole-tide walls; whereas, if whole-tide cross groins are to be first used as a scaffolding "for whole-tide walls, and with a view to filling up the shores between such groins to high "water as a preliminary step, then it is clear that there can be no retraction should the "effect on the entrance be adverse." Now, Sir, I must say that I think that is a very sound policy, to say the least of it, an extremely sound policy, that in a matter of conflict of opinion on so vital a question as the maintenance of the bar and the sea channels, it is but common sense to go by steps, and not to pledge yourself to a system which may be pernicious, and, if pernicious, can never be retracted.

One other paragraph upon the same point, which I read in consequence of some observations of the learned Recorder, commenting upon the want of experience of Mr. Rendel—an absence of what he called ascertained facts—in questions of this kind. Mr. Rendel is

Question 4391. asked, "Do you know whether there have been any observations made which enable you "to ascertain whether practice agrees with theory upon that point?" that was whether half-tide or full-tide walls best propagate the momentum of the tide——

Question 4390. (*Mr. Seymour.*) He said full-tide walls.

(*Mr. Webster.*) No doubt, as matter of abstract theory; but theory cannot take into account that which is a most material element, viz., the friction of the water upon the wall, as to which Mr. Rendel has given you this very significant fact, that there is a deposit at the foot of the full-tide walls which there is not at the foot of the half-tide walls; and I apprehend the cause of that will be found to be the friction and loss of velocity which the wall produces, thereby occasioning a species of eddy, and consequently producing a deposit. If the fact be, as Mr. Rendel states, the friction of water on a wall being greater than the friction of water upon water, that fact gives great support to Mr. Rendel's conclusion, which he asserts as the result of experience on the Dee and the Clyde; if you could introduce into your theoretical formula the amount of deduction for this friction, you would probably find that the tidal wave was as well, if not better, propagated by a half-tide wall than by a full-tide wall. The friction is an element which abstract theory not being able to take into account, renders the theory imperfect as a guide, and, therefore, in the absence of any observations which would enable this to be ascertained, you would probably come to the same conclusion as Mr. Rendel, that the difference would not be very

Question 4392. considerable. On another important point of comparison Mr. Rendel says,—"As regards "the scour due to river or land floods, it is clear that there would be no difference in their "beneficial effect whether the channel had whole or half tide walls. So far as regards "the question of land water, the half-tide walls in the Tyne would be quite sufficient." He assigns the proportion of land to tidal water as about 1·7 to 29, and expresses an opinion that the Tyne is not, in this respect, a case in any respect analogous to the Clyde, which evidence I shall have occasion to read to you for another purpose.

Now Mr. Straker had given his opinion upon the question of half as against full tide walls, and I must say, with deference to the learned Recorder, that I think Mr. Straker is a gentleman of great intelligence, and certainly of great experience, who has lived upon the Tyne all his life, and I confess that I think he is not to be treated otherwise on a matter upon which a man of common sense and a practical man may judge, as an

authority of rather a high order. After having stated that the same system had been pursued under the new as under the old Conservators, and that the Newcastle Corporation had always been able to carry the majority in the Commission, and stating as one objection the making of solid land instead of the half-tide walls recommended by Mr. Rennie and Mr. Rendel, and expressing an opinion in favour of docks, with even sacrifice of some tidal water for that purpose, which my learned friend strangely enough commented upon as a specimen of inconsistency, he says as to the half-tide walls,—"I think in time the effect will Question 81. "be to fill up to the top of that half-tide wall, but then the advantage would be this,— "while it was so filling up you would have time to dredge the shoal parts of the river, "and to make water in the channel, so that you might at least get the same quantum of "water that was displaced behind those half-tide walls. Another advantage would be, that "all the silt and sediment so collected behind those walls would relieve the channel of the "river to that extent; and there is another advantage, that supposing the whole of this "river to have full-tide walls down its sides, in cases of frost and ice in this river, which "often accumulates in great quantities, there would be no place for the ice to land upon the sides of the river; it would be confined to the channel, to the strength of the tide, and might accumulate in such quantities upon the tiers at the mouth of the harbour, that the moorings would not hold the ships, and they would be broken adrift. What the con- "sequence would be in such a case is more than I can say. I may tell you that I have "seen in a perfect calm, without any ice in the river, without any wind, ships drive out "of the harbour from their moorings with two anchors ahead, and go upon the rocks; "therefore had there been at such a time ice or a gale of wind from the west, the con- "sequence would have been a loss something similar to what they had in Sunderland, "where they are in much the position of a river with full-tide walls, because there "is no place for a ship to haul to. And another evil I may be allowed to allude to as a "shipowner and a practical man, and seeing the working of this river, I think all the "craft upon the river would be placed under such circumstances in a most dangerous "position. At present, where those inlets are left, the wherries and other boats coming "deeply loaded down from Newcastle, could haul in upon the shore out of the way of the "ice, but if there were no sides to haul to, what must be the consequence? They must "come in one compact body with the ice, and go out to sea; there would be nothing else "left for them. It is quite clear they could not haul to the shore upon those full-tide "walls, because the moment they came upon the ground they would upset and sink in "the channel." Then some suggestion being made that they could not go over the walls, he says,—"Of course they could not haul to the walls; but it must be quite plain that as "long as there was water over the half-tide walls, they could haul in there and be per- "fectly safe. When the tide fell below that, there would be no opportunity of doing so." He had forgotten at that moment that it was an essential part of Mr. Rendel's plan that there should be left openings for the purpose of rendering those spaces at the back available for the entrance of vessels and commercial purposes generally. Then he says,— "Though gentlemen do not look forward to such a thing perhaps at present, I do look "forward to the time when some of those places will be valuable to form docks, and, "therefore, instead of having to remove a ballast heap to make docks, we shall have a "place half made to our hands." I think, Sir, that the evidence of that gentleman, and the reason assigned, are of a nature which deserve serious consideration when you are considering what is to be done as a matter of policy in the treatment of the river, in a question upon which, between the engineers, there is some conflict of opinion, even if you do not agree with him entirely in the reasons which he gives.

On cross-examination, my learned friend the Recorder recurs to this subject, and Mr. Straker is asked, among other questions, whether he does not think the land behind Question 216. the half-tide walls would grow up into a solid full-tide embankment, to which he says distinctly, it would not; that it would stop at the top of the half-tide wall, and go no higher, and that the action of the lipper, as he calls it, would be such as to remove any deposit that is made. "With every breeze of wind there is a certain lipper acting over Question 220. "the top of the half-tide wall, which washes off the mud, and what accumulates one tide "washes off the next; the very action of the steamers going up and down the river causes "this, and you will see it washed down level with the top of that wall, and it will go no "higher. If that were not so, where there is no half-tide wall, and no wall of any kind, "how do you account, or how can it be accounted for, that the mud does not accumulate "there? From the very same reason go up the Thames, or any other river where "steamers go, and you will see that the little lipper of water washes away the mud and "gravel as it has lain there for some years." Now there is plenty of other evidence to the same effect. I shall not weary you by going through it; I merely point out that as a distinct statement, which is supported by several witnesses, which Mr. Rendel supports with his authority, and for which, I think, very good reasons are assigned also, and as to which there is not a particle of counter evidence upon the part of my learned friend upon it. There is no single witness who has been able to adduce a case in which a half-tide wall, subject to the action of waves of this kind, not with a transverse jetty, of course, which changes the condition of things entirely, which condition my learned friend put upon certain witnesses. There is not a single instance adduced, or a single person of experience who gives it as his opinion that the land behind a half-tide wall, left free to the action of the wind and the waves produced thereby, and by steamers passing in front of it, would grow up beyond or even to half-tide height; and Mr. Rendel tells you from his experience

Mr. Webster.

10th March 1855.

in various places, and Mr. Walker, in his report upon the Tay, says the same thing, namely, that such would not be the case. The objection, therefore, between the two is reduced simply to a theoretical question of the propagation of the tidal wave. I shall not trouble you further upon that part of the case. I have called your attention to Mr. Rendel's unequivocal opinion upon it, and to the reasons which he gives, and which Mr. Walker also confirms him in, as to the opinion that there is but little practical difference in the propagation of the momentum or wave between the full and half-tide wall, no doubt by reason of the difference of friction upon the wall and upon water, of which the fact Mr. Rendel speaks to of the deposit at the foot of the full-tide wall is conclusive evidence.

Question 4100.

Mr. Robert Stephenson gives evidence on the same point, and I shall trouble you with reading one answer only. "Half-tide walls, perhaps, might be used in the beginning to "aid in the silting up of the spaces; but my view of the action of the tidal water would "certainly lead me to the opinion that eventually a full-tide wall must be employed. "If I may be allowed, I will explain my view. Having had my attention drawn to "several rivers in this country, but more especially the river Nene and the river Ouse, "I have studied them, I think, thoroughly, and the result has been, in my mind, to view "the ingress of the mass of tidal water and its egress on the ebb as a simple mechanical "problem." That had reference to other questions about the piers, upon which I have not yet said a word; but I will read the whole. "You must treat the flood tide as a "given amount of mechanical force urged from the sea up to the channel of the river. "Now, in all tidal rivers, it is of course desirable that the tide should ascend inland as far "as possible; with a view, therefore, of allowing the tidal wave or the flood to rise to the "highest possible point, you must present to that mass of matter in motion as little "obstruction as possible, and you must also contrive to maintain the velocity of that mass "of matter as uniformly as the circumstances will admit. You ought, therefore, to avoid "deflecting the current of the tide from one side of the river to the other; it ought, in "point of fact, if it were possible, to go up a smooth, straight channel; that would be the "most perfect condition of a river possible. The wave or the flood tide being regarded as a "simple amount of mechanical force which is to be expended, you must economize it by "not allowing it to spread out into wide parts of the river, for as soon as it spreads out a "portion of the mechanical force which is given to the tide by the sea is abstracted from "the tide, and consequently the momentum that remains is very much lessened, and it "cannot, therefore, progress so rapidly or so far up the river as it would have done had "a portion of it not been allowed at every inlet to become quiescent. In fact, a portion "of the momentum or mechanical power is absorbed by every inequality of the channel, "whether it is on the side of the river or whether it is at the bottom of the river; there-"fore you ought to make the bottom of the river as smooth and as uniform as possible; "and for the same reason I think you ought to make the sides of the river as smooth "and as straight as possible, in order that as little mechanical power shall be abstracted "from the tidal wave as possible. That, therefore, brings me to the question of the half-"tide walls." I have read the whole paragraph because everything that falls from Mr. Stephenson of course is deserving, not only of being read, but of the greatest consideration. "Up to half tide the half-tidal walls would exactly answer the purpose which "I have been explaining; that is to say, the flood tide up to half tide would be retained "in as narrow and as straight a channel as possible; but as soon as ever the tide rose "above those walls, then a certain amount of the momentum which ought to be confined "to the channel would begin to expend itself in filling the inlets beyond the half-tide "walls; therefore, if my original view be correct, that is an abstraction of momentum, "and, consequently, it prevents the tide rising so rapidly or so high as it would do if "retained up to high water in one uniform channel." That you see, Sir, so far as regards the expression of opinion, is a theoretical view as to the difference of preservation of momentum between a full-tide and a half-tide wall, but which is subject to the observations I have already addressed to you about the diminution or friction upon the wall, which leads Mr. Rendel to the opinion that practically there would be little difference upon that view of the case between the two.

Question 4004.

Mr. Rendel and Mr. Walker both quote their experience in the Clyde. In reference to their opinion as to what extent the Tyne is capable of being improved, Mr. Ure was called and some other witnesses, and my learned friend the Recorder made some comments upon them. I shall trouble you with reading two paragraphs relating to that. One is from Mr. Rendel's evidence on being asked about the Clyde. He says, "It has no sea bar "or cross tide. The Clyde for 9 miles below Glasgow is only from about 200 to 350 feet "wide; its channel, which is comparatively straight, has been made deep by dredging, and "is now maintained chiefly by the flood waters of the river, confined as they are in such a "narrow channel. The rise and fall of the tide in this channel being only about half that "due to the Tyne, the tidal backwater is comparatively of little value in maintaining the "navigation up to Glasgow; and, as there is no sea bar or tidal stream across the outfall "of the river, the necessity for a large volume of tidal water, as is the case in the Tyne, "does not exist in the Clyde. In short, the Firth of Clyde is a funnel, having a small "tide through it, but ending in a very long and narrow spout, which, though it receives "tidal water, is of such a contracted capacity as to be maintained by land floods and "dredging. You may undoubtedly embank the Tyne from Newcastle to Shields, as they "have the Clyde from Glasgow to Douglas, and, with the aid of dredging, probably with "the same results; but you cannot change the form of the coast or the cross currents of

" the tidal stream into the deep converging shores of the Firth of Clyde, nor make the " tide run true up and down it. Hence the difference in the two rivers, and the necessity " for their different treatment." *Mr. Webster.* 10th March 1855.

Sir, I think that will at once dispose of all that has been said of bringing Mr. Ure from the Clyde to tell us, as we all know, the good effect of full-tide walls in certain cases, and the beneficial effect which has taken place there.

Mr. Walker also refers to the same subject, and his evidence is important, because it goes at once to the comparison of the treatment by full-tide walls in one part of the river and half-tide walls in another part, or, rather, walls no higher than the natural bank is the expression. In answer to a question from Mr. Brunel, he says, " I will assume good and " proper river lines. Then my opinion is, that full-tide walls is the proper way for " improving the navigation in the upper part, where the river, as a navigation, depends " upon the land water chiefly, and not upon the tidal water, and that carrying the walls " there only up to half-tide level might deprive the public or the owners of the use of that " ground, whilst the high-tide walls would make the reclaimed ground useful for wharfs " and other purposes of commerce; but in the lower part, where the effect depends upon " the tidal water, I think that the walls should be low, so that while they guide the " direction of the stream, the tidal water should be allowed to ebb and flow near them. " Another reason is, that at the lower end of this river you get into parts where ground is " of less value for wharfs and other commercial purposes, and therefore the tidal water " should not in that part be abstracted. The river Clyde is an illustration. I have, since " the death of Telford, been the consulting engineer to that river, which is always adduced " as one of the rivers wherein the greatest improvements have been made by art; and the " principle which I am now naming is what has been carried out there under my advice, " and the lines for walls and dykes have been laid down accordingly; the upper part " being contracted, so as to give the land waters the full effect of scour, but towards the " lower part, somewhere about Erskine Ferry, ten miles below Glasgow, we have regard " to the quantity of tidal water; and there the sloping walls or dykes are not raised higher, " generally speaking, than half tide, and no tidal water is abstracted. I should say, " therefore, that in the upper part of the river Tyne, for the reasons which I have named, " it would be a pity not to take advantage of carrying full-tide walls, but that lower down, " where the tide is the great agent upon the harbour and the bar, it is wrong to abstract " the tidal water. The upper part of the river I consider to depend upon the land floods, " and it is very easy to show that here the quantity and velocity of the tidal water is small " compared with the energy and quantity of the land floods for scouring out the river. " The one has a velocity of, perhaps, quadruple the other; therefore, and for the purpose " of trade also, the plan has been to confine and regulate the width. But when we get " down below Erskine Ferry the dykes are not to be raised much above the level of the " sand, and the tidal water is allowed to spread over the whole of the natural width. " This does not so much improve the portion immediately opposite the particular place; " but its tendency is to avoid damaging the river and estuary lower down. The quantity " of tidal water is what scours the lower part and keeps it clear. Now the lower part of " the Clyde, I consider to be, in some degree, similar to the Tyne opposite Jarrow Slake. " That is the principle upon which I have acted in all cases, and I cannot conceive a " difference of opinion on the subject." Question 4448.

You will remember, Sir, that Mr. Walker said that though the exclusion of the water on the shores might do good at a particular place, for example, Jarrow Slake, which he instanced, you might improve the river above, but you must necessarily deteriorate the river below.

We have had introduced in this case, certainly what struck Mr. Brunel and everybody conversant with the subject as a novelty, introduced as a fact for the first time, that the land water was a thing upon which the maintenance of the Tyne depended. Mr. Brooks, if you remember, started that which certainly was a novelty to the gentlemen of the locality, and which startled Mr. Brunel. And Mr. Brooks having expressed his opinion in favour of concentrating the power of the water between full-tide walls, is asked, " Whether he has " calculated the quantity of water that would thus be abstracted from the total amount of " tidal water in forming that opinion;" to which he replies, " I have not gone into that." It is a singular circumstance that whenever Mr. Brooks is asked for a calculation as justifying a statement, he has never made any such. Then, as if to cover this want of proper information, he says, " I look upon the Tyne as a river, more as a fresh-water navigation; " the freshes are the governing power in the Tyne." Mr. Brunel says, " This is quite new, " that this is to be looked upon as a fresh-water stream running into the sea," to which Mr. Brooks replies, " Not a fresh-water stream altogether, the two powers are united." Mr. Brunel says, " It being, I think, new to the Commission, and certainly quite new to " me, that we ought to look upon this river as mainly or even greatly influenced by the fresh- " water streams, it will be very essential that we should have some facts and some data which " would enable us to judge whether it is so or not. Nothing whatever that has been pre- " sented to the Commission yet would lead them to that opinion, and therefore I should " wish to know whether you can give me any data whatever as to the quantity of fresh " water which comes down?" As usual, Mr. Brooks could furnish no such data, but referred to one observation of Mr. Calver. Then Mr. Brunel, very much struck with this statement, as certainly everybody else was, pursues the subject, and Mr. Brooks repeats his opinion that the two must be conjoined. Mr. Brunel asks, " Which has the preponderance?" Question 2513. Question 2517. Questions 2523–8.

Mr. Webster.

10th March 1855.

Mr. Brooks replies, "I think the fresh water has the preponderance over the tidal water as "regards its influence in keeping open the channel. I think the fresh water has the "governing influence in keeping open our deep channels. The general effects must be more "produced by the tide if you take an average. The general result is greater as produced "by the heavy freshes." Now I must say this evidence is perfectly inconsistent with itself. He first tells you that it is a fresh-water river practically. He then says, you must conjoin the two. Then when he is pressed he says a greater effect is produced by the tide. And then, in conclusion, he says, "the general result is greater as produced by the heavy freshes." This is a novelty of Mr. Brooks, but I do not think it is a matter upon which I ought to occupy more of your time. Therefore, Sir, I shall not, being of that opinion, occupy your time with Mr. Taylor's evidence upon the same matter, which was of an equally extraordinary character. Mr. Taylor is a gentleman of great eminence in the district as the mineral surveyor of the Duke of Northumberland, and an amateur engineer, as he himself expressed, never having had the conduct of any works. He produces a book of his, containing a purely theoretical calculation of the quantity of fresh water, and he says, "I think the "freshes under proper control ought to be the governing power in the river."

Question 2791.

You will remember that this came upon us all by surprise. That the foundation of this was pure speculation, as to the rainfall and the quantity of water for a given drainage area, a question which any gentleman of experience in waterworks inquiries knows to be about as deceptive and speculative a thing as any in the world. Without gauging the quantity of water which really comes down the streams, such evidence is not worth the paper upon which it is written. Captain Washington, who had given attention to this matter, states in his report (p. 12) the amount of fresh water in the river in its ordinary state as compared with the tide to be insignificant; and Mr. Rendel's evidence to the same effect has been already noticed. Mr. Robert Stephenson, who came here not professing to have any details of information, was actually persuaded, relying, I presume, upon Mr. Brooks' information, and if I had asked him the question he would actually have committed himself to the same opinion, showing how cautious one ought to be. Mr. Stephenson, in the answer he first gave, says,

Question 4164.

"I cannot say that I am prepared to give in figures the quantities of land water and tidal "water. I do not say the land water is larger, but looking to the quantity of tidal water "which comes in, the land water forms a very sensible portion of the whole." I then ask him, "To what point have your observations been directed at which you give that proportion?" and he says, "About Blaydon, three or four miles above Newcastle, the tide runs up there." Why, I have no doubt that at Blaydon, which is above the substantial tidal range of the bulk of tidal water wholly above the estuary and above Newcastle Bridge, the fresh water does bear a considerable relation, but it was really misleading Mr. Robert Stephenson, for those gentlemen who instructed my friend the Recorder to put the question to him in that way upon that matter when he came to be examined.

(*Mr. Seymour.*) The question was put by yourself.

(*Mr. Webster.*) Whether by myself or not is immaterial, he was not instructed by me. Here was a gentleman, whose information was of a very general nature, and who, so far as any information had been furnished, was instructed by those who instruct my learned friend, not by any other person, therefore, relying upon that he is led to give the answer to the question, which, whether put by my learned friend or by myself, would have misled equally as though put by you, that up to Blaydon, three miles above Newcastle Bridge, the fresh water was properly the governing influence.

I think, therefore, that you will be of opinion upon the, I can hardly say, conflict of evidence, as to the difference between half-tide and full-tide walls as a question of propagating the tidal column, because the only conflict of opinion is founded upon a theory which is not applicable to this case, and having reference to the known and admitted facts respecting the two, then, the sound and proper course to adopt is to adhere to that which Mr. Rendel has pointed out as at least the prudent course. Begin in the first instance with the half-tide walls, do not commit yourself to a step which can never be retrieved, and which may be detrimental.

Who are the persons objecting to this? only the Newcastle interests and those who advocate the views of certain landowners. Mr. Robinson, Mr. Mather, and Mr. Clay are actually, as appears by the resolutions upon the books and by the evidence before you of the first two gentlemen, Mr. Clay not having been called, decidedly in favour of half-tide walls. Then what is the result? Why, that as between the minority and the majority there is actually only the casting votes of the Chairman, representing the landowning interest, who hold together in a bond of connexion with the representatives of the Corporation of Newcastle. You have, in addition to the six persons who constitute the minority, Mr. Robinson, Mr. Mather, and Mr. Clay, who have expressed their opinion unequivocally in favour of half-tide walls in preference to full tide walls; therefore, if you look at the question as to what ought to be done, you have a bare majority, not more than one against those Commissioners, who are decidedly in favour of half-tide instead of full-tide walls. Is it not common sense and prudence, in a matter of this kind, with a majority, consisting as it does of gentlemen guided by Mr. Brooks as their engineer, by the Corporation of Newcastle and the landowning interest, who are clearly most deeply interested in this question of full-tide walls, that the majority ought not to be allowed to override the minority by a casting vote on a doubtful question, which may lead to a step which is irretrievable, namely, sacrificing the banks of this river to whole instead of half tide walls.

The majority of those who have advocated this in the Commission make no secret of their

views upon it. Let me call your attention to one piece of Mr. Cowen's evidence, and as the views and the motives of the minority have been assailed by my learned friend the Recorder, I am bound to inquire a little as to what possibly may be the influences to which the majority are subject. Mr. Cowen represents himself as the champion of the landowning interest; he says, "I am aware, from living in the country, of a little of the feeling of the "parties, and there would be a determination, on the part of the landed proprietors, "amounting to something beyond what I believe my friends at the mouth of the river "calculate upon, to get a fair representation of the whole parties from one end of the "river to the other. In my view of the question (of course I do not say I am right) "there can be nothing unreasonable, and no impropriety in such men as the Duke of "Northumberland, and such men as Mr. Ellison, of whom you have heard so much, who "have such large estates, thinking that they have a fair right to be represented in this "Commission. I maintain that it is the legitimate way in which the thing ought to be "done if there is to be a change; but these men are not seeking for any change. I "believe they would say that at the present early stage of our Commission it would be a "very impolitic measure to take." Then he is asked, I will read the whole paragraph and dispose of it at once, "In your opinion as a whole has the Commission worked well and "efficiently or not?—I think it has worked well. I not only think so, but I feel it; I "think it has worked quite as well as anybody could reasonably expect; and my own "view of it is that the greatest benefit which can be conferred upon it is to leave it and "its officers alone." I should wonder if Mr. Cowen did not think so, if Mr. Clayton did not think so, and if Mr. Brooks did not think so, and if the whole of these parties of whom we complain did not pray, in a truly corporate spirit, "Leave us alone," as every body sought to be reformed has done before. Then Mr. Cowen says subsequently, "There "is just one other matter upon which I would make a remark." It is very odd that Mr. Cowen should volunteer this; he is not asked it; it shows how his conscience pricked him a little, and he must disburden himself. Mr. Armstrong says, "You were in debt "upon that particular score?" that is, the law charges, to which he replies, "We were "paying off the debt. I believe we have now paid off all our legal charges, amounting to "somewhere about 18,000*l*." Then he proceeds to this new subject, "There is just one "other matter upon which I would make a remark, which is this: I have no connexion "whatever with the Corporation of Newcastle: I have no place in it; I have not that I "know of even a vote at Newcastle for the Councillors; I have offices at Newcastle, but "only within the last few years. My place of business is chiefly five or six miles up the "country, and therefore I have no connexion either directly or indirectly with the Cor-"poration of Newcastle." What is necessary to constitute a connexion, then, with the Corporation of Newcastle? Cannot that be had without having offices there? Does he forget what Mr. Clayton told us upon that point? Gentlemen who wish to purge themselves upon matters which seem to press them a little bit, and as to which they are not asked any questions, should, like great wits, have great memories. What did Mr. Clayton say, giving evidence upon the constitution of the Conservancy Commission, which he speaks of as a compromise. He is asked, "In that arrangement was he (Mr. Cowen) con-"sidered as a Newcastle representative?—He was, I think, recommended by the pro-"moters of the Bill. "As a Newcastle representative?—Exactly so, if you suppose that "the promoters of the Bill act for Newcastle." The Corporation of Newcastle were, Sir, as you will remember, the promoters of the Conservancy Bill. I think really the pains this gentleman took to purge himself of the suspicion of any connexion with Newcastle a little misplaced. I do not think it is a connexion that he need be at all ashamed of in any way; he is a most admirable representative of the Corporation of Newcastle; they are a most respectable body, but in connexion with the landowning interest, of which Mr. Cowen is the avowed champion, they are not quite the body who ought to be left in the undisputed control which they have of the interests of the river.

Mr. Webster.

10th March 1855.

Question 3617

Question 3621.

Questions 3508–9.

Sir, in viewing this question as to what causes may have influenced the efficiency of the Conservancy Commission, and as to what it ought to be for the future, you have another element introduced which has influenced, as we think, the improper expenditure of the funds of this Commission, and the state of things of which we complain, namely, the coal-owning interest, which is so admirably represented by Messrs. Carr and Philipson, or by Mr. Philipson as their solicitor. Observe what Mr. Philipson says in speaking of the Hay Hole Docks: "The whole trade of the Hay Hole is carried on by Newcastle coal-"owners. I may say, although the docks where the coal is shipped are locally within the "borough of Tynemouth, yet I do not believe there is a person in the borough of Tyne-"mouth that has the slightest interest in the trade at all, or on that shore." And in answer to the question whether the Conservancy Commission had worked efficiently, he refers to these docks. I must say that I was a little surprised at that when I knew, and he probably must know, what was the great opposition on the part of the Shields party to the Hay Hole Docks, that the way in which the Commissioners availed themselves of their power in attempting to mortgage the river dues, was one of the grievances complained of. I was a little surprised at Mr. Philipson bringing in the Hay Hole Docks to the credit of the Commission. I apprehend that is anything but to the credit of the efficiency of the Commission; it is one of the grounds on which the minority may very properly complain. He says, "My opinion is that the Commission has worked efficiently, and I think the "proof of it is to be found in this, that under its progress we have seen arrangements "made for the piers, for the Hay Hole Dock, and for the Jarrow Dock, all measures of

Question 3869.

Question 3871.

Mr. Webster.

10th March 1855.

Question 3871.

" great importance. I beg also to say most distinctly that I do not consider that there is " any ill-feeling or ill-will on the part of the Commissioners one towards another." I do not suppose there is, I never supposed there was; I am only surprised Mr. Cowen should have thought that he could not avail himself of the hospitality of the Mayor of Tynemouth because of the complaints which had been made on the subject of the general management of the Conservancy. Mr. Philipson says, " I believe that we are all private " friends, and desirous to do what may be best for the interest that is committed to our " charge. The only vexed question which remains amongst us is this question, whether " there should be half-tide or full-tide walls. On that of course men may differ, but they " may differ without quarrelling, and I believe that we are at present approximating to a " very much better feeling; and to use an expression which has fallen from some of the " other gentlemen who have been examined, if we are let alone I have no doubt we shall " be harmonious." The expression he refers to is an expression of Mr. Cowen, praying to be let alone; then he says, " I do not believe that there is one of the Commissioners " who has an adverse feeling to the port of North Shields. I disclaim it myself altogether. " I say the trade of this district must be viewed as a whole, and if North Shields increased " in importance, I should be very glad of it; but I am quite sure it would not so increase " without the trade of the country in which I live benefiting, and the town in which I " reside also benefiting."

Sir, one of the Royal Commissioners asked some questions about the way in which the interest of North Shields, as regards the Tynemouth docks and quays in particular, had been treated. You will find the fact, whatever may be Mr Philipson's personal feelings, and I do not mean to say he is not on perfectly good terms with every member of North Shields, there is no reason why he should not be, to be, I believe, that on every occasion when any project has emanated from North Shields, either for the construction of a quay, or for the construction of docks, it has been opposed either directly or indirectly with the whole force of the local parties at Newcastle, and of the Corporation of Newcastle, that represented in the present Conservancy by a majority of the Commissioners; therefore I really lay on one side all those professions of good feeling—we know what that means perfectly well—what are the facts? Why is it that those gentlemen at Shields have been and still are so dissatisfied, and have gone and still go to such an enormous expense for the purpose of getting what they conceive to be their wrongs redressed?

I am not going to trouble you with any lengthened observations upon this matter of credit, which Mr. Philipson takes to the Commission, upon the question of the Hay Hole docks; but you must remember that, so far from that being a proof of the efficiency of the Commissioners, I think, upon the facts which have appeared before you, it is one of the strongest instances that can possibly be adduced, that the Commission is not such a Commission as ought to be entrusted, or one that has worked well for the interests of the river, having regard to the shipowners and those who pay the dues.

One paragraph from Mr. Walker's report to the Admiralty, and one passage from the evidence here, will set that matter as fully before you as I desire to do. Mr. Rendel, as you remember, when the engineer of the Conservators, had advised half-tide docks, the coal-owners, of course, were anxious that they should have full-tide docks, because it is better for the coal-owners to have full-tide than half-tide docks, inasmuch as the shipowners would be more likely to come there; but how did they seek to do it? They sought to mortgage the river dues for the purpose of giving security for the money by which this Hay Hole dock was to be made exclusively for the benefit of the coal-owners. It was a matter of inquiry before Mr. Walker; he was so struck with the irregularity, the impolicy, and the injustice of this attempt, that he comments upon it in his report which is before you, of which I shall only read one paragraph referring to the objection to mortgaging these river dues which was raised. You will remember, Sir, the independent party at Shields, who are now the minority, were obliged, at their own expense, to oppose in the Admiralty inquiry and in Parliament this project of the majority of the Commission. Mr. Walker says, " The answer to the fourth objection may be said to be contained in that to the first, " and in reply to a suggestion from me that the five-eighths of the coal due belonging to the " Corporation of Newcastle (under whose management the injury to the shipping places " had occurred) might be joined to the portion of the three-eighths belonging to the Com- " missioners, which it is proposed to mortgage for the security of the debt; it was stated " by Mr. Clayton, that had the suggestion been made in time, he did not apprehend there " would have been much, if any, objection to it, but that a clause to that effect could not " now be inserted in the Bill, as the notices had not been framed to include such a measure." Now, just observe the position in which the interests of the Tyne and those who pay the rates, the landowners and coal-owners not paying the rates, were placed. The majority of the Commissioners bring in a Bill for making docks, and, contrary to the advice of Mr. Rendel, full-tide docks; they seek to mortgage the river dues to give security. The shipowners' party, the minority here, are obliged to oppose that measure at their own expense, notwithstanding the objections that were made to it before Mr. Walker, which he thought well-founded, and so well-founded, that the Corporation of Newcastle ought to give five-eighths of the coal duty in order to raise the money; notwithstanding that, they introduced it into Parliament; the shipowners are obliged to oppose it then at their own expense, and what was the result? Why, Sir, the result, as it appears by the Act of Parliament (15 Vict. c. 90) was, that after a large expenditure of the Commissioners' money in promoting this Bill, which ought never to have been promoted in that shape,

Mr. Webster.

10th March 1855.

and which never would have been promoted except for the peculiar constitution of the majority in the Commission, of which we now complain, Parliament refused them that power, and inserted this remarkable clause, the third section of the Tyne Pier Act, 1852: "That the owners, lessees, and occupiers of coal mines, the produce of which is or shall "or may be shipped in the Hay Hole or in the docks, and the owners, lessees, and occupiers of railways used for conveying such produce to the Hay Hole, the docks, and the "owners, lessees, and occupiers of land abutting on the site of the docks, shall be disqualified from acting as Commissioners under the Tyne Improvement Act, 1850, in any "matter relating to the said docks." Why, Sir, when Mr. Philipson and Mr. Cowen referred to the proceedings relating to the Hay Hole dock, as a triumphant proof of the efficient working of this Commission, in answer to your questions, I say not only does it not prove it, but it is one of the strongest instances that can be adduced to show you that the Commission is not such a Commission as ought to be continued, if you should think it your duty, as I trust you will, to call attention to the influences by which the majority are now controlled, and the minority overruled.

I said that the question of solid land and embankments as against half-tide walls, was a question first of navigation, but secondly, a question relating to the landowners. You will remember the arrangements which were suggested by Mr. Allhusen and by other members of the Commission, that land so situated should be the subject of compulsory power under an Act of Parliament, for the purpose of being properly dealt with. And I need not do more than submit to you that it is perfectly impossible that any Conservancy can deal satisfactorily with the interests, such as they are, upon this river, except something tantamount to that, or a control either of the Admiralty or by Parliament should be exercised upon these foreshore rights. Whatever may have been Mr. Allhusen's original view in making that proposal, or those who supported him, I am very sorry he should have thought fit to change his opinion upon it. No doubt he has been anxious to do the best he could for the Commission, but I submit to you, that looking to what has taken place upon the Tyne with regard to making these embankments and making this land, it is perfectly impossible that the public interest can be preserved so far as regards the encroachments upon the tidal area, except Parliament, the Admiralty, or somebody control those interests as to the way in which those large spaces of tidal area and foreshore are to be dealt with. In the case of its being done by independent parties, as, for instance, a railway company, who come for the Jarrow docks, or an Act of Parliament, as in the case of the Hay Hole docks, Parliament has power over it; but the mischief complained of is, that Parliament has not provided any sufficient Conservancy power, but that, in consequence of the way in which this Conservancy Act was brought in and obtained as a compromise by the Newcastle people, the public are left without any adequate protection.

Closely connected with this question, as I opened it before you, is the ballast question, upon which we have had a good deal of evidence, and in which Mr. Brunel has taken a good deal of interest. Observe, Sir, how that evidence stands. The Conservators receive under the Act of Parliament 1*s.* 4*d.* a ton for ballast from the ship. They pay various sums, amounting to 11½*d.*, 11*d.* and 10*d.* The Corporation receive 8*d.* for providing a place of deposit. Mr. Poppelwell and Mr. Stevenson made a motion that they should only receive 6*d.*, on the ground that they themselves had actually granted a licence in former times at 6*d.* It was well known to be a very profitable speculation to the Corporation, and their accounts show they get as much as 800*l.* a year by it. Then, is it right that the majority in the Commission, which the Corporation can clearly control, should continue to obtain, by reason of such a majority, a larger sum than it could be done for by other parties having lands situated as the Corporation have? There is a distinct case clearly proved before you of such a conflict of interest between the Corporation as renders it impossible that the officers of the two bodies, like Mr. Brooks, Mr. Clayton, the Town Clerk, can properly discharge the duties which devolve upon them. If the minority had been allowed to have their way, and the Corporation had been compelled to take a less sum, there would have been that saving of revenue that might come to be applied to the river works, which at present only amounts to the insignificant quantity which I have already spoken to.

Questions 685–90.

App. page 22.

The question of ballast is one which has received a great deal of attention both from Mr. Brunel and other members of the Commission, and therefore I do not propose to occupy any more of your time upon that subject. Some reference was made to the encroachments of Messrs. Palmer and Leslie. In connexion with that subject of ballast, it did not appear what they received for the ballast which they were allowed to deposit there. Also, some observation was made on the part of my learned friend the Recorder as to an advertisement put in respecting the letting of land which was to be reclaimed under these alleged licences from the Conservators. My learned friend the Recorder seemed to misunderstand the way in which I used that. I do not mean to say that Mr. Leslie or those interested in the land had been guilty of any secresy in what they had been doing; I only alleged that they would not have done that unless they had known that they could rely on a majority among the Conservators in support of their views. They would never have ventured at that time to advertise land for sale, with a good water frontage, unless they had known, either through their solicitor, Mr. Clayton, or from some other source, what was the feeling of the majority of the Conservators on the subject of such enclosures, before they actually made an application for a licence, or obtained any grant upon it.

Connected with the ballast question is the dredging question, which Mr. Brunel examined into so thoroughly with Mr. Murray, and upon which my learned friend has commented so

Mr. Webster.

10th March 1855.

little, that I need do no more than call your attention to it as a matter directly involved in the allegations of the minority, and as a matter upon which we trust some recommendations will be given in your report.

I have already called your attention to the nature of the interest that Mr. Cowen has in this matter as representing the landowning interest, and I must also call your attention to a particular paragraph in his evidence, in connexion with the evidence of Mr. John Thomas Taylor, upon which I must found an observation. Mr. Cowen, like Mr. Philipson, had on other occasions intimated his great anxiety to do everything that was necessary for the Shields people, and therefore would give them all the accommodation that was necessary, the Conservators themselves, I presume, being the judges of what was wanted. He says

Question 3599.

in the course of one of his answers, "Whilst I would prepare, in the first place, certainly, "for the most ample accommodation of the people of Shields, I see no reason whatever to "despair if we could do away with Tyne Bridge, so as to pass ships through it, of our "having docks of considerable magnitude much higher up the river than where we are "sitting. There is far more likelihood of that than there was of the people of Glasgow "getting their ships up where they were trying. Therefore, during the time of my being "in the Commission, while I have attempted to be as conciliatory as possible to the oppo-"sition, I have wished to look at the whole thing as an entire matter." Why, Sir, here is a gentleman who, surely, if Mr. Brooks adheres to his crotchet of full-tide jetties, has a crotchet quite as laudable and quite as pernicious probably to his independence in the Commission, being, as he is, a Newcastle representative, and avowing that this is one of the matters upon which his heart is set. This crotchet you must couple with the singular evidence of Mr. John Thomas Taylor, the mineral surveyor of the Duke of Northumberland,

Question 2763.

who propounded to you a theory whereby he was to get an extent of compensation by means of a receptacle at Stella, of a capacity equal to three times the capacity abstracted at the lower portion of the river; all this being formed on calculations which, curiously enough coincided with Mr. Brooks' suggestion as to the amount of water to be abstracted by the

Questions 2773–76.

proposed line of river walls, though neither of them appeared to have the least information as to the average depth of the Tyne, or of the cubical contents of the water to be abstracted, that being a mere matter of speculation, Mr. Brooks never having given it. Thus, in connexion with Mr. Cowen, the Chairman, the one has the theory of the docks above Newcastle Bridge, and the other the theory of getting a receptacle there which shall more than compensate for any abstraction of water. Is not this altogether visionary? Is not this a matter which, really if it does not, I will not say, disqualify them from taking a calm and candid view of the matter, yet is to a certain extent the key of their views, in opposition to the interests of the Shields party, whose plans for quays and docks were approved by independent persons. Mr. Rendel, when engineer of the Conservators, and the Admiralty, have thought that docks at Shields and a quay at Shields were proper things; and nobody, I think, except Messrs. Cowen and Taylor, ever dreamt of above bridge at Newcastle being a proper site for docks. I say, when you are viewing the motives of parties, as my learned friend the Recorder thought it necessary to do, when you are viewing this fact, that the Shields people complain of the species of opposition they have experienced, when one of the learned Commissioners thought fit to inquire most pointedly of Mr. Cowen as to what

App. page 23.

Question 4416.

were their real motives in opposing the North Shields Quay, and expending as much as 1,800*l.* of Commissioners' money, in opposition to the Tynemouth Docks, the project of 1852, which had received the sanction of the Admiralty and of Mr. Rendel, as Mr. Macartney told you; I must say, if you do so, I trust you will take this whole case into your consideration, and make the result of this Inquiry beneficial to the public. You cannot disregard the interests of these respective parties, and Mr. Cowen, as the representative of Newcastle, having his theory of docks above Newcastle, whether he knows it or not, is a person who has as strong an up-river interest against the Shields people as any of the members of the Corporation of Newcastle themselves have.

(*Mr. Cowen.*) There was an Act of Parliament for making a dock at Newcastle last session.

(*Mr. Webster.*) We shall see whether it is ever made, and what sort of ships get up to it; that, however, does not at all detract from my observations on the theory which Mr. Cowen indulges in, or the observations he made in answer to a question from one of the learned Commissioners. He is asked about the question of the north quay, and the Tynemouth Docks, although it had been approved by Mr. Rendel, yet nevertheless, it was dealt with in such a manner, that practically, one Bill was thrown out, and the other mutilated so that nothing has come of it.

Sir, I am obliged to Mr. Cowen for having called my attention to that question, because that reminds me of a matter which is also essential to be considered by you with regard to the various interests of those parties. The local interests in this river are so great, that upon certain questions as regards the views taken by South Shields gentlemen, and also the views taken by gentlemen of North Shields, which you have already had partially developed to you, as for instance, the question which arose about cutting off White Hill Point, that it is impossible the matter can go on harmoniously unless there be some appeal or some control which shall say what is right to be done for all parties. It will be quite sufficiently in your recollection, that every person whose attention has been called to the subject, from Mr. Rennie downwards to Mr. Rendel, and Mr. Walker in his report upon the Hay Hole Docks, is struck with this fact, that nothing had been done at that point. Mr. Walker says, "I consider it proper to notice in connexion with the change which

Mr. Webster.

10th March 1855.

" the proposed docks would make in the present channel of the river, that both " Mr. Rennie and Mr. Rendel have recommended the removal of Hay Hill and White " Hill Points, but that no provision is made in the Bill as it now stands for either of " these desirable works, so that a compulsory power for the purchase of the premises that " would be required cannot now be given, but I would suggest that power be given to " the Commissioners to effect these improvements with the consent of the owners and " occupiers." Perhaps that was one reason why they never chose to employ Mr. Walker upon the Tyne generally, because they knew of course that any engineer who could afford to be independent, and was independent so far as his professional reputation was at stake, would insist upon having those extravagant points cut off, and also have insisted upon some provision being made for protecting the interests of South Shields, as the result of interfering with that natural protection.

When I opened this case before you, Sir, I said I should not condescend to inquire into inches of water. I have already called your attention to the fact, that from natural causes, the bar varies as much as two feet, that every variation on the bar and those irregularities in the sands and in the harbour are evidence, as Mr. Rendel expressed it, of a state of disease; he described, or other witnesses described, the existence of the bar as a balance between the tendency to deposit by the sea, and the power of removal by the current. Sir, it is one of the facts which you cannot overlook, coupled with the protestations of Mr. Cowen and Mr. Philipson, how warmly they feel for the interests of Shields; you cannot overlook this fact, that not a single penny has ever been spent on Shields harbour, (I believe a few stones have been removed,) but it is a most startling fact, that when nine-tenths of the tonnage of the Tyne do not go out of the borough of Tynemouth, there should not have been any expenditure within that borough, except such as the shipowners have raised by an additional voluntary tax, namely, the mooring tax, for the purpose of obtaining moorings. My learned friend the Recorder was instructed to ask several of the witnesses the question whether the money raised for moorings had not been laid out in improving Shields harbour; that was money raised by an independent Act, consented to on the part of the shipowners, who submitted to an independent tax, having failed in any attempt to get proper moorings provided by the Corporation of Newcastle out of the river funds. There were no other places than Shields harbour where the moorings could have been laid down with any effect; and now that the channel has been so contracted above, you have heard of notices requiring not more than one ship to be moored; there could be little question as to the places upon which the money might have been spent. What we complain of is this, that the bar has not been made and maintained at least six feet better. Why, was not that, which the Admiralty in the correspondence which I am glad to see before you has insisted upon as a condition, done years ago? Have not the minority and the public generally the most ample grounds of complaint against the state of neglect in which Shields harbour and the bar has been left? Is there any prospect of that being remedied for the future, except by some species of control, some total change different from the existing state of things? No answer has been attempted to that part of the charge, which, when I opened this case before you, I read most distinctly from Captain Washington's report at page 3, referring to great improvements which had taken place at Sunderland, the neighbouring river, whereas nothing of the kind had been attempted for the harbour of Shields.

Amongst other matters that the Chairman and Mr. Philipson have paraded before you, I believe in addition to the Hay Hole Dock, which, as I have already observed, so far from being a credit to the Commissioners, is rather a discredit to them from the way in which it was managed by the majority, is the Jarrow Dock; that is a thing with which they had nothing to do, being promoted by and in the hands of the railway company. The piers have also been paraded before you. I do not know how far I ought to touch upon this delicate question of piers. I think I ought perhaps to leave the matter in your hands. You are already aware of the fact, that there has been a great delay, and that the business as relating to the piers has been managed by a secret committee, that Captain Linskill was refused to be placed upon it, and that whoever may be to blame, the fact is, that until the Admiralty interfered in the most summary and stringent manner, the matter of piers was in a perfect state of confusion, and when your Commission began its sittings, there was no engineer for the piers, in accordance with the condition imposed upon the Commissioners by the Admiralty. The Piers Committee had brought matters to such a state, and their brother Commissioners did not know how matters were, that the piers were actually in a state of suspense until after the sitting of your Commission; it was not until the 22d of February, as appears by the correspondence before you, that matters were at all restored to anything like a state of successful issue upon this question, in which the shipowners were so much interested.

Although, Sir, I shall not infringe upon the injunction given me to abstain from matters relating to the correspondence, I think I should not be doing my duty to you if I did not call your attention to a few observations relating to engineering questions which have been urged upon you with respect to the piers. I have already pointed out, that if Mr. Walker is right in the views which he takes of the abstraction of tidal water interfering with the tidal area within, the encroachments ought to be stopped immediately, and reduced to the smallest possible amount.

Mr. Stephenson agreed entirely with Mr. Walker in viewing the question of the admission of water through the piers as a simple statical question, that is to say, he considers, having regard to the state of things outside the piers, when the piers shall have been con-

Mr. Webster.

10th March 1855.

structed, that you may liken it to an opening or orifice in the side of a pipe, and that the quantity of water that flows in will be due to the hydraulic head and the capacity of the receptacle, so that as soon as a level shall have been obtained no more water will enter. Therefore, though he agrees with Mr. Walker as to the question of what is the controlling power on the outside, yet he differs, and they are at issue, as to the way in which the receptacle may be allowed to be dealt with. That circumstance alone will show you that this is a case in which very considerable caution ought to be exercised.

Sir, I do not know how far you may think it is open to you to express an opinion about what is a most serious question, namely, the position and extent of the north pier; but I think as the evidence has been given it will be my duty to address to you a few observations upon it, and to represent what I really believe to be the state of the question. All the engineers agree, I think, that some inner works will be essential hereafter for the training of the river; therefore those piers, which have been taken out almost to an extravagant extent, and which embrace an immense area, will require inner works of some kind or other. Mr. Walker suggests that training banks of faggots may be adopted, but I do not think that any gentleman who has had experience of the state of the sea at the entrance of the Tyne, would think that faggot banks of that kind would retain their position.

Mr. Rendel and Mr. Murray are of opinion that the placing of the north pier in connexion with the land in that precise position, with regard to the south pier, would be an engineering blunder. I think that some light may be thrown upon this subject by considering the history of the present piers, and how this question has been introduced. The piers, as projected in 1852, and upon which Mr. Walker reported, were piers of a different description, much more inland than as now proposed, and supposed to be approved by the Admiralty. The piers which the Commissioners had approved, or rather had selected, as appears from the evidence on your table on the Inquiry before Mr. Walker, had not the approval of their then professional adviser. Mr. Clayton states on the Inquiry before Mr. Walker in 1852 (page 5), that the Commissioners "have taken the best opinions, and "they have consulted all the evidence that could be offered upon the subject, and they have "formed their judgment accordingly. They have directed the piers to be laid down on "the plan both on the north side and on the south side of the river, varying somewhat in "shape and in position, from those laid down by Mr. Rendel, with lines of deviation which "will admit of the adoption of the piers suggested by Mr. Rendel if it should be found "ultimately desirable to adopt them; and with respect to the short inner piers laid down in "Mr. Rendel's plan, they have passed a resolution that they will execute those piers out of "their general funds if it should be found necessary that they should be executed. Mr. "Brooks, the resident engineer of the Commissioners, of whose talents and whose acquire-"ments in his profession I wish to speak with much respect, adopts the piers which the Com-"missioners have caused to be laid down on the Parliamentary plan. At the same time I "ought to mention that if Mr. Brooks had had his own way he would have drawn the northern "pier from the point of the castle beyond Prior's Haven; that is not on the Commissioners' "line, but it is the line which Mr. Brooks, their engineer, would probably have preferred. "I thought it due to Mr. Brooks to make this statement." That, Sir, was the state of the pier question in March 1852. The Act was in Parliament in 1852, and was obtained with general powers of deviation. Mr. Walker, in his report then, having expressed no opinion upon the piers as brought before him, excepting that it was desirable to afford some additional protection at the entrance of the Tyne; the piers were to be commenced in two years from the 17th of June 1852, the date of the passing of the Act. On the 24th of February 1853, the matter was agitated by the Admiralty. No account is given of the delay, but at that time the Tynemouth Dock Bill was before the Admiralty and before Parliament. That Bill was opposed by the Commissioners and Mr. Brooks, although for docks substantially the same as Mr. Brooks had recommended himself at that spot on a previous occasion. The plan was approved by Mr. Rendel, and was consistent with his inner works, and by the Admiralty. About that time the question of a harbour of refuge at the mouth of the Tyne was agitated by deputations, which have been referred to before you, to the Chancellor of the Exchequer and other Ministers. It was urged by the Commissioners, "postpone the inner works till the outer piers are done." That was most unsatisfactory to the Shields party, and was looked upon as one of the devices to which resort was before had to prevent them getting the kind of accommodation upon which their hearts were so much set. I cannot but say that the resolution to which my learned friend the Recorder has referred to, apparently as a triumphant answer to the complaints made of the conduct of the Commissioners with reference to the Tynemouth Docks, was rather adding insult to injury. Because to talk of sitting down to wait until piers of this kind were constructed (as to which Mr. Walker could give no idea when they would be constructed), and if they are to be constructed according to the plan proposed they would most probably take some 20 or 30 years to complete, I must say to do that was only one of the tricks of getting rid of the urgency of the Shields people, to say that they would make the inner works after the outer piers were completed.

Page 231.

Mr. Clayton, probably having ascertained that Mr. Walker would be inclined to adopt the views which Mr. Brooks entertained in March 1852, about the position of the piers (for Mr. Brooks told you they were his piers), suggested as a compromise that the matter should be referred to the Admiralty, and as a result of that Mr. Brooks' plan of piers have been selected by Mr. Walker and accepted by the Admiralty. The Piers Committee appear to

Mr. Webster.

10th March 1855.

have proceeded very much upon their own authority. The Chairman, Mr. Cowen, was somewhat offended at my having been so presumptuous as to doubt the power and judgment of the Piers Committee, when I asked him whether they had proceeded upon the advice of Mr. Walker. No, he said, the Commissioners had done it. "It was upon the advice of "the Commissioners as to purchasing the land under the power which they had under the "Act of Parliament, and as to carrying a railway from where the stone is to be had to the "piers, it is upon the authority of the Commissioners and not of Mr. Walker or anybody "else." Whether Mr. Cowen, who is to have docks up at Newcastle, was sufficiently qualified as an engineer to construct a railway, and purchase the land and purchase the quarries containing the stone and material for the construction of piers, may be doubted. Mr. Walker has told you in as distinct terms as could be expected from him that this was a matter upon which he ought to have been consulted. I think that may be perhaps a key to the conduct of the Commissioners in more respects than one. Question 3641.

In September of last year a motion was made by Captain Linskill as to why the resolution of the Commissioners about piers of the early date of May had not been communicated to Mr. Walker and something done upon it. All that Mr. Clayton told you was "I can only say that I did all I could to get it carried out." The correspondence which has been produced partially discloses the real state of the case, and I do not think I have a right to take you further into that question after your decision upon it. Question 3459. Pages 334–5.

One question as to the position of the north pier, and the evidence brought to bear upon that is material; Mr. Rennie tells you in his report at page 109, "That in the making tide "when the current runs to the south it sweeps round the head at Tynemouth Castle." I observed upon one of the charts which Mr. Walker produced, though I did not find it on Mr. Rennie's or Giles' chart of 1813, the precise direction of the current laid down in arrows. If it be true, as stated by Mr. Rennie, that the flood tide sets in in that way, and it being undoubtedly true that the entrance to the Tyne, notwithstanding this projecting north headland, is a species of trumpet-mouth, the views advanced by Mr. Rendel and stated so fully in his evidence are views that cannot be disregarded in this Inquiry. He tells you that it is a mistake to suppose, as Mr. Stephenson had done (you remember Mr. Stephenson's evidence was given upon the supposition that there was really no inset of the tide into the harbour except that due to the external statical head), that it was not anything like a trumpet-mouth entrance, such as some of the places referred to, and that even now it was in the same state as it would be after the piers were made, and that it was simply a question of passing tide without any tendency to set in at a trumpet-mouth entrance. Now Mr. Rendel says, "The outer part of the Herd Sand is covered at a very early time of "flood." Mr. Robert Stephenson, you will remember, had assumed that it was not covered till a very late time of flood. "When I was last there the head of it was very flat; a large "portion of it is submerged and connected with the sea bar. It would, I should think, "be quite incorrect on any assumptions that are made as to the effect of these piers of "Mr. Walker if constructed, to assume that there would be a distinct channel, and that the "Herd Sand would not be covered excepting at a late period of the flood." So that upon the views which Mr. Rendel and Mr. Murray take of the present state of things at the entrance of the Tyne, and the flood tide stated by Mr. Rennie as setting in round the Tynemouth headland, you must regard the Tyne as having something of a trumpet mouth, in considering the effect of which you must take the whole area across the Herd Sand as giving the sectional area, upon which you are to calculate the amount of water entering across the Herd Sand, and which becomes accumulated upon itself in passing through the Narrows; that is the principle and in which Mr. Murray and Mr. Rendel concur entirely; but upon the facts as to which Mr. Stephenson was not informed, and which principle is consistent with the illustration he gave in reference to the Severn, I asked Mr. Stephenson several questions founded upon his experience in the Nene and the Ouse, which had simply reference to the necessity of some inner guiding walls for the purpose of directing the current, believing that his experience had led conclusively to this, that in order to get the full effect of the stream in and out, you must have something in the nature of guiding walls. On these points Mr. Stephenson in evidence agrees with the opinions of Mr. Rendell and Mr. Murray, and the only difference between them was that Mr. Stephenson did not recognize at the entrance of the Tyne an accumulation of tidal water upon itself due to the set of the tide into the mouth in the way Mr. Rendel and Mr. Murray had explained it. Pages 320–22,324. Question 4332. Question 4148. Question 4333. Question 4231.

Mr. Rendel, in speaking of the effect of the proposed piers, adduced instances in nature of the headland to the north and the headland to the south of the set of the current, and he told you that judging from what took place in other instances, in his opinion the north pier ought not to be connected with the mainland, and that the south pier ought to project to a certain extent, if possible, beyond the north pier, so as to catch the set of the tide and young flood at the earli st moment, and turn it into the harbour. In that opinion he was supported entirely by Mr. Murray, who tells you that when his attention had been called to the state of the entrance of the Tyne, before any of the plans had been promulgated, and from the experience he had had of similar works in Sunderland, his views were, "Confining the mouth by piers, the southern one running in a circular direction, and the "northern one south of the Spanish Battery, so as to cover the Black Middens and the "rocks here, which were so dangerous to shipping, I think that it would be preferable "to be open for the purpose of allowing the flood-tide to pass. By striking a solid pier, "the waves would be diverted into a large beaching basin on the south side, but the mo- Question 4592. Question 4592.

Mr. Webster.
10th March 1855.

" mentum which would be given to the water by striking a solid pier would be to throw " it further up the river. Then the ebbing current would be confined at the Low Lights, " so as to make it act with some force upon what is called the 9-feet bar, and carry on the " impetus of the water so as to act upon the bar beyond the pier heads. My great object " in those piers, from what I have seen and studied, particularly at Sunderland, has been " to throw off the large body of water as much as possible, from the momentum of the tide " striking a solid body in coming up the river depending more upon that than upon sta-
Question 4600. " tical pressure." Then he referred in explanation, in answer to a question by Captain Fitzroy, to the effect of what he called the wave trap, and illustrated it by the case of Sunderland. He also illustrated his position by stating that in a particular case at Sunderland, from what he had seen of the operation of the south pier, he believed that the rise of the tide in the river and the amount of water thrown into the harbour, would be
Questions 4703–4715. increased if the north pier were wholly removed. He says on the question of inner guiding walls, that in order to preserve the momentum of the entering tide, piers more or less parallel would be essential, that " if the headland at the mouth of the Tyne were removed " and there were projecting land on the southern side of the harbour, the tide would be " heaped up into the Tyne more than at present;" that such an effect would, to a certain extent, be more a question of momentum than of statical pressure, the object being stated nearly in the same terms as contained in Mr. Rendel's report, which is, I think, the only paragraph I shall trouble you with from that document upon the question of piers.
App. Page 47. " The south pier head, projecting as it does east of Freestone Point and of the north pier " head, will catch the flood-tide stream as it comes down from the north, and send it into " Shields harbour in a direct course. It will prevent the wheel and other cross currents " due to the flood-tide overrunning the harbour's mouth, and it will shelter the whole of " the channel, from the bar to the Narrows, from the south-easterly gales." Then speaking of the inner piers, he said, " Their objects are to aid the outer piers, in giving a proper " direction to the stream of flood and ebb between Shields harbour and the bar, thereby " scouring out the Middle Ground and part of the Insand, and in effectually stopping the " passage up the river of any sea or sand that might enter through the openings in the " outer piers or otherwise." Mr. Murray, referring to that, adopts substantially the same principles. He says that the object of his inner piers is to aid the outer piers, which, as
Question 4727. he has said before, were substantially the same as Mr. Rendel's, and " to catch the young " flood as early as possible coming from the north, and to turn it into the harbour, and, " secondly, so to direct it by means of inner piers that that flood tide should go in as true " a channel as possible over the bar, both on the flood and on the ebb;" that there was no difference in principle between his piers and those which Mr. Rendel had proposed; although they differed in little details, in shape and form, yet they answered substantially the same purpose and were founded upon the same principles.

Then Mr. Walker having told you, and other witnesses having been asked questions have told you, their opinion upon the effect of the bar, Mr. Murray says expressly that
Question 4763. the bar must follow the piers to whatever distance they are carried. " The crest of the
Question 4764. " bar must lie beyond the head of the pier; all bars lie beyond the pier." He says, " If " I am asked my opinion which I would prefer, whether Mr. Walker's piers opening in " the direction in which they are shown there, or those which are laid down by me, I prefer " my own both in an engineering and in a nautical point of view. The bar is the present " bar at the mouth of the Tyne; the bar may be altered in its position by piers either of " a shorter or of a longer kind. The bar which is now existing will not be the bar when " Mr. Walker's piers are made, and it may be in a totally different position if Mr. Rendel's " piers are put there. The nine-feet bar, which now exists in the interior portion of the " harbour, would be dispersed by the building of those piers at the Narrows, and the cur- " rent would be outwards. Naturally a bar will be found at the mouth of a tidal river, " wherever the ebbing current meets with the body of water in the open sea, and the bar " will be found beyond the pier heads whatsoever piers are built." Therefore, Sir, I think you must take it as the result of the evidence of Mr. Robert Stephenson, and, in fact, as the result of all the evidence, and of a very decided opinion upon the part of Mr. Rendel and Mr. Murray, without impugning or entering into any question of Mr. Walker's piers, some inner works will be essential; that you cannot have the water guided over that large estuary and the large expanse that will exist there, compared with the opening between those piers, without some inner works. Therefore, in viewing this as a question affecting the navigation of the Tyne, if you should be of opinion that Mr. Brooks' works, or any works of that kind, can be allowed to go on at the present moment at all in the way in which they have been going on, or that it would not be dangerous to attempt to continue works which should at all interfere with the tidal receptacle, so as to diminish that which Mr. Walker says is essential for the good effect of his piers, it will be part of the matter that must receive your consideration, whether in regard to works suggested, there must not be some inner works in connexion with the piers to train the channel, and to guide the water as part of the navigation question.

If you look to Mr. Walker's report upon the piers, and at the evidence which has been given here, you will find that those piers have been adopted more upon a naval question
Question 4260. than a navigation question. Mr. Stephenson told you expressly, " I think the pier ques- " tion resolves itself into a purely naval one almost," and it appears also, in looking at Mr. Walker's report on the piers (15th November 1853), that the witnesses whom he examined the notes of whose evidence he offered to the Conservancy Commissioners.

Mr. Webster.

10th March 1855.

and which I was anxious to put before you, expressed their opinion upon this rather as a naval and nautical question as to the entrance of ships in certain winds, than as a question affecting the navigation. I think, therefore, from the views which were dominant at the time as regards the question of harbours of refuge generally, and the attempt which was made by the deputation, the Chairman, and Mr. Mather, who, you will remember, made a speech before Mr. Cardwell and the Chancellor of the Exchequer, which is contained in the pamphlet handed in to you, you cannot but regard that, in the selection of those piers, the Commissioners have been rather led away from that which was undoubtedly the original question, when it was considered in 1852, namely, a navigation question; that the inner works of the Tyne can never be considered complete, except there should be added on to these piers something that shall provide for the training of the channel; and that the suggestion of the Commissioners to do it now out of their own funds, or that the works at Shields shall be postponed until the outer works are completed, is only one of those suggestions which parties who are not thoroughly sincere in promoting the works at Shields would readily fall into, and that it is a matter which must necessarily create very deep anxiety upon the part of the Shields people as to what would be the probable effect upon them if such should be the course of proceeding which is allowed to prevail.

I have now, Sir, gone through the general features of the case, and it is only necessary that I should call your attention to one or two subsidiary matters, and to the general line of evidence which is before you. I do not think it necessary, nor would time allow me to enter in any detail upon it, and I am sure you would not wish it, as I am afraid I have already exceeded the limit which the learned Recorder for Manchester thought sufficient for any speech.

But I must generally recall to your recollection the position in which the questions before you stand. In opening the case before you, I referred to the numerous publications and documents, to the enormous amount of talent and labour and time which had been expended in writing upon the Tyne, with what little result I think must have struck you and every one of the Commissioners, as it has struck many persons, and amongst others Mr. Rendel, upon whose observations the learned Recorder has commented. Every one must be struck with how little has been the result—with how little has been done since 1813; and how questionable, if not prejudicial, has that little been? The minority allege, in substance, that the disease still exists, and that the symptons are still the same; that although the House of Commons had decided in 1849 to change the Conservancy, and a new Conservancy Board had been constituted in 1850, of which the Corporation of Newcastle, the then Conservators, were themselves the promoters, yet the Newcastle interests were still the Conservancy only in another form; that the head of the river, having this majority and control, consisting of the Newcastle and of the landowning interest, dominant as against the interest of the lower end of the river and of the shipowners, and there being no controlling body at all, the officers, the clerks, the treasurer, and the engineer, with six nominees of the Corporation of Newcastle, being substantially the new Conservancy, it was hopeless that the gentlemen of Shields, who had shown themselves so anxious for the improvement of the river, certainly upon no private grounds, but upon public grounds only, could ever attain that which they anticipated and hoped to attain, namely, the carrying out the improvement upon sound engineering principles, as disclosed in the reports of Mr. Rennie and Mr. Rendel. That was the general case which I laid before you, and to which my learned friend the Recorder really has given no answer at all. You will remember that I called your attention to the reports of Mr. Rennie and Mr. Rendel, of Captain Washington, Messrs. Lawes, Abernethy, Mr. Walker, Captain Vetch, and Mr. Calver, containing specific recommendations as to matters which ought to be done, none of which have been done, but which have been systematically evaded, and that the encroachments and works complained of have continued the same as before; the funds have been frittered away upon matters from which the public generally derive no benefit whatever. These matters were set forth distinctly in the memorial of the minority, who knew well the grievances, and they believed they knew the cause and could suggest the only remedy.

My learned friend the Recorder of Newcastle has treated this very much as a personal attack upon the majority of the Commissioners. I trust that I have said enough to satisfy you and satisfy him that no one of the minority ever treated it in that way, but that they viewed it as an attack upon the system, as an attack upon the constitution which they believed to be vicious; that the system never could be altered so long as the constitution of the Commission remained as it was.

My learned friend the Recorder in commenting upon the witnesses certainly misrepresented them in many respects; I am quite sure unintentionally, but most grievously.

(*Mr. Seymour*) Just as unintentionally as you have done to-day.

(*Mr. Webster.*) I am quite sure he has misrepresented the witnesses unintentionally; but I think I have not dealt in language conveying personal imputations at all resembling the language or the imputations with which my learned friend the Recorder of Newcastle attacked the minority, defending his clients and the Corporation of Newcastle, with whom he must now have a considerable sympathy, and who he thought it necessary should be defended, I had almost said whitewashed, on the spot which they hold so dear. My learned friend cannot be surprised that some of my clients at Shields, feeling strongly that which other people have felt, the sort of antiquated state of dependency they have been and still are in upon Newcastle, I could not but be amused at the paragraph with which my learned friend concluded his speech from Macgregor's book, recommending Newcastle

Mr. Webster.
10th March 1855.

to lay aside the petty jealousy of sister towns, and to exercise corporate prerogative with discretion, as the means of preserving her empire and crowning the scheme of local aggrandisement without risk of her pre-eminence, as the panacea of all grievances. I must trouble you, before I conclude, with a few observations to disabuse the mind of any who may refer to my speech after reading the speech of my learned friend, for the effect

Page 270.

of the misrepresentations of the evidence: first, as regards Mr. Straker, whom he represents as stating that no money had been expended except at Newcastle. Mr. Straker is

Question 199.

asked, "Up to what time do you say that no money was expended except at Newcastle? "I think you were speaking of before 1850?—When I spoke of no money being expended, "I think I stated between White Hill Point and the bar; between White Hill Point "and the bar I observed that no money had ever been expended, that is, in the lower "part of the river. I will not say between this time and the other time, but not in the "memory of man, not one shilling has ever been expended there, with the exception "which I make of removing a few of the stones within the bar." That was the answer which Mr. Straker gave, which might be supposed to qualify his preceding answer; therefore it is not right that it should be allowed to stand upon the speech of my learned friend the Recorder, that Mr. Straker had said positively that which he never had done, although in spirit it was true, that no money had ever been expended excepting that in which Newcastle interests were chiefly concerned.

(*Mr. Seymour.*) I was commenting upon his examination in chief; that is, in his cross-examination

(*Mr. Webster.*) When a learned Recorder is commenting upon a witness's examination in chief who has set himself right either in cross or re-examination, it is only right, and it is due to the witness, that an answer shall not go forth to the public as an answer to that which is not the fact in the intention of the witness. Then my learned friend comments

Page 270.

upon his signing a statement to Sir James Graham, and says, "So that this gentleman, so "much in favour, and seeming to pride himself upon his feeling in favour of docks, signed "a statement that he regarded the Jarrow Docks as an injurious and enormous encroach-"ment upon the river Tyne." Mr. Straker never said anything of that kind, nor does the memorial state that in substance. This is a matter that has been repeatedly misrepresented. All that the memorial does is this, it represents the allowance of the Jarrow Docks as one of those matters which render it necessary for those who are charged with this Conservancy to be excessively cautious how far, after so large an abstraction has been allowed, you shall

Question 79.

allow any further abstraction of water. What Mr. Straker did say about the docks is, "I "would even sacrifice a little of the tidal space for the purpose of obtaining docks. I "would go as far as that; nay, I would go a little farther, and I would say, that wherever "it is shown to be absolutely necessary for the purposes of trade, even in such cases they "might dispense with a little of the tidal water; but, as a general principle, I object to "removing any tidal water, excepting for such purposes as I have now named; and I "would say more, especially that as the very same object can be attained, in my opinion and "in the opinion of those engineers whom I have quoted, by half-tide training walls, I can "see no necessity for making full-tide embankments and solid land." That is what Mr. Straker stated, and therefore, Sir, the unqualified assertion of my learned friend the Recorder is not supported by the fact, and ought not to go uncontradicted.

Then, Sir, my learned friend refers to some confusion into which Mr. Straker had fallen upon looking at the copy of Rennie's chart of 1813, as to the condition of Hebburn Shoal. There is no doubt upon the evidence of Mr. Danson and others that shoals have sprung up which were not in existence before. That is a matter which does not rest upon

Page 79.

Mr. Straker's evidence; he may be mistaken as to the particular point; he was confused by the map, as he subsequently explained, as to one locality. The evidence is before you, and you are instituting so elaborate an inquiry as to the state of the channel that I need not pursue this subject.

Another observation which my learned friend the Recorder made as to the evidence of Mr. Poppelwell was not justified by the evidence of that gentleman. Mr. Poppelwell had spoken of the great value of land reclaimed for water-side purposes, and he had assigned a value of 1,000*l.* an acre. Mr. Stevenson assigned 30*l.* an acre per annum as rental. I think, Sir, probably Mr. Stevenson,—certainly if the insinuations against him of my learned friend the Recorder are in his own opinion of any weight at all,—is a gentleman not unacquainted with the value of land for manufacturing purposes on the Tyne. What Mr. Poppelwell was speaking of was the value of this land which had been acquired by the Corporation of Newcastle and others for manufacturing purposes; but my learned friend the Recorder

Page 272.

represents him in this way. He comments upon what Mr. Poppelwell and Mr. Stevenson have in point of fact said, as follows:—"When we hear of the Dean and Chapter selling a "very valuable piece of land at Jarrow, which was in contemplation for docks, and to which "the attention of a railway company was directed, at 30*l.* per acre, perhaps we shall be "justified in relying upon that practical proof more than upon the opinion of good "Mr. Poppelwell, with his land at 1.000*l.* per acre." First of all, there is no evidence of what the Dean and Chapter did sell for 30*l.* an acre.

(*Mr. Seymour.*) Yes, there is.

Page 232.

(*Mr. Webster.*) Not for Jarrow Docks; that related to the mouth of the Tyne. If it did, what does it show? That the railway company are far better managers than the Commissioners.

(*Mr. Seymour.*) It was the Jarrow Docks.

(*Mr. Webster.*) It does not matter; the two cases are not at all parallel: they are wholly distinct. The land at Jarrow Slake is quite different from the land Mr. Poppelwell was talking of; the one being unreclaimed, and to be made, the other having been made out of the river funds in front of established manufacturing premises. *Mr. Webster.* 10th March 1855.

You will remember, Sir, that a great many questions were asked upon the cross-examination of witnesses as to what works have been done, and you would have supposed from the way in which the questions have been put that there had been a great number of works done upon the Tyne; and my learned friend the Recorder, commenting upon Mr. Straker's evidence, says, "He had been asked the day before to show a single instance wherein works "had been inefficiently or injuriously executed upon the river." The only works that have been executed recently are those full-tide jetties and the walls, of which Mr. Straker gave several instances of being so inefficiently constructed under the old Conservators, that the refuse and ballast had been allowed to come out from behind them into the river; as to which I shall have a word to say presently.

Then my learned friend comments upon Captain Linskill's evidence, and there again, any person reading what my learned friend the Recorder says, would have very much misunderstood what the gallant Captain said. What he did say about the Committee system is this: he is asked whether "the Commission has worked efficiently?" and he replies, "I "am sorry to say I consider that it has been a complete failure, all the causes which led to "the transfer of the Conservancy I consider still exist, and more than that, I think there "is a very bad practice existing in this respect. The Commission is materially worked by "a system which used to prevail before the passing of the Municipal Reform Act in 1835, "by means of Committees who conduct their proceedings with extreme closeness, and "keep but a very imperfect record of them. I am obliged to say it. I am sorry to say "it." Then he refers to Mr. Philipson having referred to the appointment of Committees as an unconstitutional and illegal thing; to the way in which their reports are brought up, and to his having been excluded from the Pier Committee on the opposition of Mr. Philipson. That is the complaint he made of the Committee system, as administered. He never complained of a Committee system, if properly administered, as leading to a division of labour; but, from the observation that fell from my learned friend, it would be supposed that he really had complained of it, whereas what he complained of was a very different system. Page 273. Question 948. Question 950. Question 902. Question 1022. Questions 1042–44.

The witness upon whom my learned friend fell foul, in the strongest terms, was Mr. Stevenson; and there are two or three positive inaccuracies to which I must call your attention. He says, "But here a charge is made by Mr. Stevenson, from which, I think, "the character of the Chairman might have saved him. He makes a charge against "Mr. Cowen, in his position of Chairman of this Commission, that he had some private "interest. He tells us that the dredging machine was sent to do work at Mr. Cowen's, "instead of elsewhere." That is a pure mistake and misapprehension on the part of my learned friend. Nothing of the kind took place. Mr. Stevenson made no charge at any time against Mr. Cowen. I do not know that he ever referred to his works. If he did it was to refer to the fact that his works were silting up. It was Mr. Brooks who made the so-called charge. Page 274.

(*Mr. Seymour.*) Mr. Stevenson distinctly referred to that.

(*Mr. Webster.*) I thank you for the correction; I was about to repeat what Mr. Stevenson said, that his work had silted up. What Mr. Brooks stated was this, that the excellent Chairman's works had been silted up by reason of the operation of the works; that he had had no dredging done yet, but he deserved it. It will be in the recollection of those present whether that was not what Mr. Brooks said. All that about Mr. Cowen's private interest, or any insinuation against the Chairman, has been purely the imagination of the Chairman himself. I am sure nothing was further from Mr. Stevenson than to have made any insinuation of the kind. Question 2185–8.

Then my learned friend comments on Mr. Stevenson having wound up his engineering assertions by saying this,—"I consider Mr. Brooks' works a total failure." I think I have already addressed all the observations I need do upon that point;—whether assuming those premises, Mr. Stevenson was not justified in saying, looking to Mr. Brooks' representations of what he would do with his full-tide jetties, and the absence of the necessity for dredging, that his works had been an entire failure.

Then he comments on what took place about Mr. Stevenson and his brother having made a proposal to contract to take the ballast to sea, in conjunction with another firm; I believe, also, about some piles being put down without authority. Mr. Stevenson had been asked upon that distinctly. He told you that he had a lease of Messrs. Cookson, gentlemen who had enjoyed beneficial leases of the Corporation of Newcastle, and that he had done nothing except what had been authorized to be done; nothing at all that had been complained of for several years. But, Sir, if there were any truth in that, that Mr. Stevenson, or his partners, had done anything which might be a subject of complaint to the Commissioners, why, Sir, did not the Commissioners stop it? Does not that go to show the inefficiency of the Commission, so far as regards the looking after the river works, and to support part of the suggestions which I made in my opening speech, as regards the state of dilapidation and the want of proper looking after the ballast nuisances which take place in this river.

(*Mr. Seymour.*) That was at the time the Corporation had it; it was not in our time.

Mr. Webster.

10th March 1855.

(*Mr. Webster.*) Then if what Mr. Stevenson did was in the time of the Corporation being Conservators, my learned friend, upon his own showing, ought not to refer to it, because one of the great grievances made against me here is, that I have referred to matters that took place during the time when the Corporation were the Conservators, and therefore the reference comes with an especial bad grace from my learned friend the Recorder, who complains of my referring to what took place under the old Conservancy, and who ought not therefore to have entered on matters according to his instructions so wholly foreign or to have made observations or put questions reflecting upon a gentleman of Mr. Stevenson's position on matters which took place under the old Conservancy. Those who instructed my learned friend must have known well that they did take place under the Corporation, and that he personally had nothing to do with it.

Reference was also made to the proposal to carry out ballast to sea at 11*d.* per ton when he had reported it could be done for 2½*d.* The 2½*d.* that my learned friend the Recorder refers to was ballast dredged; that is quite a distinct thing to taking ballast out of the ships. But why was not something of that kind adopted? why have the Conservators adhered to the old system of dealing with ballast in the face of the practice in other places, but by reason of the profit made by the Corporation of Newcastle, and landowning interest, persons interested in the deposit of ballast upon the foreshore? If the Commissioners had taken Messrs. Stevenson's contract which was proposed, they would at once have gone into competition with those persons who had beneficial leases from the Corporation. You heard of Messrs. Cookson, of the firm of Swinburn and Salmon; Mr. Salmon was to have been called as a witness before you, but was not called although my learned friend obtained a summons for that purpose. The new ballast conveyers would at once have gone into competition with the lessees of the Corporation, and have reduced the price. That would not have been agreeable, and that is why those gentlemen who constitute the majority of this Commission, and who are either the nominees of the Corporation of Newcastle, or identified in interest with them, so strenuously support the existing system. It is hopeless to expect that you will get any redress, or that any economical system will be adopted so long as the majority retain the control they have now.

Page 275.

My learned friend the Recorder says, I must say with extraordinary hardihood, which nothing but the zeal of a Recorder in advocating corporate interests could have induced him to have done, that there were no conflicting interests, no questions in dispute, or that can arise between the Corporation of Newcastle and the Conservancy. Are there no questions upon ballast licences, or what ought to be paid to the Corporation for the deposit? Are there no questions upon the encroachments? Are there no questions upon the compensation for past encroachments? Are there no questions as to the right to deposit ballast granted by the old Corporation at the time they were going out of office, and not confirmed by the Commissioners? Are there no questions of the claims of the Corporation to the foreshore which we allege to belong to the public? Are there no questions as to the town dues and coal dues, three-fifths of which Mr. Walker thought ought to be pledged for the making of the Hay Hole Dock? Are not these questions of the most vital importance, in respect of which the most direct conflict may and ought to exist between the Corporation and the Conservators? Is there not another class of questions of the greatest importance, to which I referred in my opening, and to which Mr. Brunel referred most pointedly, the state of dilapidation of the quays and banks? My learned friend and the chairman, Mr. Cowen, repudiated the notion that the Conservators might be blind to the commission of nuisances, and Mr. Brunel referred most pointedly to the evidence, as he expressed it, of his own eyes, of ballast or other materials being still put in from the existing quays to the river. You will be astonished if you look at that book, Appendix No. 14, the Corporation or Commercial Guide; you will find a chart of the river with all the buildings put upon it, and every owner and every occupier, and you will find there, out of 160 or more properties, I have an analysis here numbered down to 160, beginning at No. 5 down to No. 14, Corporation, owners—quays, inferior, built 2½ years ago, dilapidated, dilapidated, entirely fallen down, much dilapidated, in bad repairs. Are not these questions upon which the Commissioners, if they had done their duty, or if they were in a position to do their duty, or if there were any person in the position of a public prosecutor to have kept them to their duty, must have taken some steps and gone to work at once, and have taken them up. There are in that book abstracted now for the first time from records of the Commission, statements as to Corporation property, some in the occupation of the Corporation themselves, others in the occupation of the lessees; I do not refer to names of individuals, lest I should be thought to make personal charges, which I do not wish to do so, but property which is declared to be in a dilapidated state, subject to all the objections which Mr. Straker pointed out, as to the objectionable mode in which the work was done, and the inadequate state of the quays for preventing nuisances; would it not have been one of the first steps of an independent Commission, or if there had been a public prosecutor, or some person as there is in the Mersey, to have taken care that the Corporation having made this land out of the river funds, should at least prevent nuisances of this kind. It is not the Corporation only; Messrs. Cuthbert Ellison and Smith are recorded there, properties 45, 46, and 47, as having quays bad and tumbling down and imperfect; the Corporation properties 52, 53, and 56, are described as having quays irregular and much worn and broken down. The quays of the Duke of Northumberland, in the occupation of Messrs. Isaac Cookson and Company, to whom my learned friend has referred, and others, are described as merely a

Mr. Webster.

10th March 1855.

few piles packed up with boards. "Quays ricketty, buildings of all sorts of rubbish, much "out of repair." Sir, not to weary you with cases of that kind, I have said quite sufficient to illustrate my views. There follows then a list of other properties, numbered from 96 to 160, on several of which, described as belonging to or occupied by the Corporation, or Mr. Armstrong, (the Treasurer, I presume,) or Brown, Ellison, and Company, who have been before you about the encroachments in Jarrow Slake, and as having quays very much out of repair, old and out of repair, unsubstantial, irregular, cheap quays, very old and tumbling down. Why, Sir, I say for my learned friend the Recorder, or those who instructed him, to tell you that there are no questions of the most vital importance of conservancy between the Corporation and the present Commissioners, really only arises from the ignorance which is illustrative of the way in which the business of this Commission has been conducted.

My learned friend then comments upon Mr. Calver and Mr. Brooks, upon their contest, upon which I have said all I mean to say, and I trust I have satisfactorily cleared Mr. Calver from any imputations under which he may have been placed——

(*Mr. Seymour.*) Any imputation from me was not directed to that part of Mr. Calver's evidence.

(*Mr. Webster.*) My learned friend concluded his address by expressing a hope in a portion of which I certainly concur, though I do not concur in the introductory part of it. I concur in this, that they (that is the majority) think they are themselves entirely capable of managing their own house. No doubt they do. Never was there a Corporation or an existing body which was sought to be reformed that did not think so. Their local interests are too deep in the matter with which they are entrusted, to judge properly of their own position, and therefore they say that the proper and legitimate way of uniting those discordant elements in their body is, that some authority should either pass judgment with them or against them. It is because their local interests are so great, having regard to those influences which are insensibly followed out, and as to which I make no impeachment, and no insinuation against the individuals personally, nevertheless I say that the local interests are so great and so antagonistic to conservancy interests, and that the local influence is such that it is impossible in a river constituted as the Tyne is you can have an efficient conservancy without a public prosecutor, or without a public conservator as they have at the Mersey, and without the control of some public body who shall say what ought to be done or what ought not to be done.

That I think is sufficient for me to answer in reference to questions and observations which my learned friend the Recorder, acting I am quite sure upon the instructions he had received, appeared to consider as pressing personally upon his clients, and which he made against some of those whom I represent. I am quite sure it was no more his intention than it was my intention to misrepresent any of their statements.

You, Sir, were pleased to put to the witnesses severally certain questions, upon the answers to which, with your permission, I will make one or two observations. You asked Mr Straker whether he thought the river had been much retarded by the disputes and litigation which had taken place between Newcastle and Shields, to which he replies he did. Mr. Stevenson in reply to the same question says, that he "is quite of opinion that "the energies which should have been spent upon the common good of the river had been "spent in those local disputes." Now, Sir, those gentlemen naturally feel, knowing full well that they really have no personal interest in the matter at all, that they are here as public Commissioners, and claim the same credit which my learned friend claims for the majority, and say that the circumstances in which they are placed are such, that it is impossible that those local questions can fail to arise. Mr. Stevenson and Mr. Straker, in reference to your very considerate suggestion as to whether they could not forget past differences, say that it is not a personal matter, there has never been any difference at all; they are only surprised that Mr. Cowen, the Chairman, should have felt the letter of the minority to be a personal matter, such as to interfere with the harmony which existed; they take this up on public grounds only; they say that the system is vicious, it must lead to injury, it has kept the Tyne in a state of deterioration, and that such a state of things must continue as long as the Commission is constituted, as it is contrary to the nature of things and impossible to forget those things while they still exist.

Question 292.

Question 1443–5.

Mr. Cowen and Mr. Philipson adopt naturally here very different language in answer to the same questions. Mr. Cowen thinks that the improvement of the river has not been much retarded; that it has been retarded to a certain extent; he quite agrees that differences ought to cease, and he does not see why they should not cease. He is fully aware that you, as a Commission, have no Parliamentary powers to alter such a state of things. But, Sir, it will be the first time in the records of this country, that the recommendations of a Commission, constituted as this Commission is, having given the time and trouble which you have done to this matter, should not be followed up by Parliamentary powers, or by whatever may be necessary to give full effect to them. Therefore, Sir, I am not, nor are those who instruct me, at all deterred by the threat which Mr. Cowen held out on behalf of the landowners and other interests, when he says he is fully aware that your recommendations would not have the effect of an Act of Parliament. "And that is the "reason why I stated that in the event of any such Bill going to Parliament, especially if "it had reference to a change of the constitution, we should have applications from all the "landed proprietors for a change of the constitution of the board. That the greatest "benefit which can be conferred on the Tyne is to leave the Commissioners alone. If

Question 3697.

Question 3700.

Mr. Webster.

10th March 1855.

" not interfered with, the Commission will work well, and accomplish all that anyone can " expect from it."

Sir, I should have been a little surprised, as of course you would have been probably, at Mr. Cowen not having adopted language similar to that; but are you to be deterred, or think you that the minority who have, as Mr. Straker told you, succeeded in emancipating Shields, as far as regards its custom house and port, from the thraldom of Newcastle, are to be deterred by any threat of the opposition of the landowners, as Mr. Cowen calls them, to the measures which you may recommend? Nothing would be more likely to conduce to the successful carrying of measures of that kind through Parliament than its being seen distinctly from this evidence and from your report what are the nature of the interests opposed to the public interests upon this river question; it is virtually a landowners question as against a shipowners and a nautical question, involving the interests of the navigation generally. You will, Sir, remember that the minority are in favour of the Admiralty and central control. Mr. Mather is in favour of it, and Mr. Robinson. I hear somebody say, No; but Mr. Mather asserted distinctly, in answer to a question from myself, that he was in favour of a Board of some kind or another having control; the nature of the Board is not very material, but it is necessary that there should be some control to overcome those local interests. What Mr. Robinson says upon this point is very material, because it indicates to the public what is the real condition of parties. Mr. Robinson was asked as to the history of the Conservancy Bills, and whether, in the Bills introduced in 1849 and 1850, there had not been a clause giving control to the Admiralty, whether there had not been an equal constitution and an equal representation from each end of the river, and whether, under the control of the Admiralty, they had introduced powers constituting the Conservancy, as proposed by the Shields party and by the Newcastle party. He says upon this, " When the parties on both sides withdrew at the " recommendation of the Committee of the House of Commons to endeavour to come to " some agreement, it was there stated that Newcastle would fight to the death on the subject " of Admiralty Commissioners. I stated myself that I thought it was not a subject of that " importance for us to fight for. I had not very strong opinions upon it, and I also, when " a life Commissionership was offered to me, declined to accept it, preferring rather to " trust to the townsmen to be elected by them. I think a representative body is better to " be solely representative, and I think that those who raise the money should have the " charge of the responsibility." Sir, I say that these gentlemen have acted consistently; they were thankful to get what they could, having exhausted themselves fighting by their own independent means the existing Conservators, who were fighting them out of the funds which they were themselves paying. The Corporation of Newcastle had the purse, which the shipowners were providing, and they were fighting them, the shipowners, with their own money. The promoters of the Bill of 1849 and 1850 knew full well that this Conservancy Bill, which the Corporation had been obliged to bring in under public pressure, would be the stepping stone to another if necessary. They were not then, nor are they now, at all deterred, though Mr. Cowen may have sounded his note of opposition, in which he threatens to combine the whole of the landowning interest, and that the Corporation of Newcastle declare that they will resist any change to the death.

Question 3776.

Question 3854.

Now, Sir, can you be satisfied to leave things as they are, because that is the practical question which you will have to decide when you make your report? What are the Conservancy works? Are the full-tide transverse jetties such as you can sanction as engineering works, and declare that they have not had or will not have, which is more material, an injurious effect upon the navigation, and upon the works in progress at the mouth of the river for removing the sand banks? Can you be satisfied with the general way in which those works have been executed, having regard to the various accounts which have been given of the way in which they have grown up, or can you be satisfied either with the general conduct of the business of the Commission on the state of the questions of claim to the foreshore as part of the public freehold, and the claims of the Corporation to the soil, the ballast question and the state of dilapidations, and the nuisances which exist upon the banks throughout a considerable portion of the river at the present moment? Can you see any remedy for that, excepting the obtaining from Parliament much more stringent powers, and the appointment of some person who in the nature of a public prosecutor, or in the nature of a public conservator, may be independent of local parties, and whose business and duty it may be to proceed without preference, favour, or affection, against all persons, whosoever they may be, that may be liable in respect of such dilapidations and nuisances? I shall also pray you, Sir, to take into your most serious consideration whether any river constituted as this is, with large tracts of land sought to be reclaimed from the freehold of the public, the foreshore which is now the freehold of the public, and to become the property of the landowners, whether it is not right that this should be placed under some compulsory powers of Parliamentary control, and that the value of the land when made, whether it be a benefit to the adjoining estates, or whether it be an injury to the adjoining estates, should be properly compensated for in money? This, again, is a most vital question between the Corporation and the Conservancy Commissioners. You heard from Mr. Clayton that the Corporation insisted upon the fundus and soil of the river as their freehold. He refused to give any account of the money received for royalties and licences in respect of such ownership. That is a question which must at some time or other be settled, and it is no answer to suggest, as my learned friend did, that the ordinary tribunals of the country are open to you; that if

Mr. Webster.

10th March 1855.

they are not the owners of the soil, indict them; to talk of indicting them as the Corporation of Newcastle, under such circumstances, is idle. Indictments were tried as to this river and without success, and that was the answer attempted to be given by some noble lords in opposition to the first Conservancy bill, on its second reading in the House of Lords, who thought that such a bill was an interference with existing rights; an indictment under circumstances of this nature is wholly inapplicable. Nothing but Parliamentary powers placing the river under proper control can meet the emergency of this case.

Then, Sir, the only point to which I need direct your attention, and upon which I need say a word, is the way in which the revenue has been appropriated. It must have startled many of you, as it startled Mr. Brunel, that on river works or improvements there has not been an expenditure of more than about 2,000*l.* a year. It is stated in Mr. Stevenson's evidence to be a sum so insignificant that it arrested the attention of Mr. Brunel, and led him to a searching examination into various items of expenditure and the ways and means of the Commissioners. The expenditure occasioned by the promotion of the Hay Hole Docks, and the expenditure in opposition to the Tynemouth Docks, were expenditures that ought never to have been incurred, and would never have been incurred if you had had an independent Commission, or a Commission under the control of the Admiralty, or some parties who had no local interests to serve. I say these expenditures are symptoms of disease, and are matters deserving and that ought to receive your anxious inquiry.

App. Page 22.

(*Mr. Seymour.*) The Hay Hole Docks expenditure was paid out of the dock fund.

(*Mr. Webster.*) The accounts will show for themselves. I should be sorry to misrepresent anything, but you will remember that was a measure promoted by the majority of the Commissioners in opposition to the report of their engineer, Mr. Rendel, which was opposed by local parties out of their own pockets before Mr. Walker, and which opposition they were compelled to follow to the House of Commons, and which was successful. The attempted mortgage of the river dues led to the insertion of a clause which prevented the landowners shipping at those places having any voice in the management. That, Sir, is a matter for which of course some parties have paid or will have to pay. The accounts will show what were the expenses connected with the Hay Hole Dock; that the expenses of the Bill should have been paid out of the special fund does not at all remove me from the position I have taken, that the Shields parties were subjected to peculiar hardship by reason of the local interests which first put in motion this dock. No such answer applied to the 1,800*l.* for the opposition to the Tynemouth Dock, which Mr. Macartney spoke of as having received the sanction of the Admiralty and all the authorities.

This case, Sir, has received the most attentive consideration at your hands; the minority feel extremely indebted to every member of the Commission for the facilities afforded in bringing matters before them. The position of the minority was certainly a peculiar one, because here was a minority upon whose suggestions the House of Commons, the public officers, and the Crown have thought fit to act, by appointing this Commission to inquire into the Tyne, and to inquire into matters which have hitherto been a matter of inquiry before a Parliamentary tribunal. It was almost hopeless to expect that any other course could have been adopted, because the majority of the Commissioners who, as it has appeared here, did resist, and would, of course, have resisted, and had the means of resisting any inquiry of this kind, supplied as they are with officers and funds; unless this course had been adopted, the matters now inquired into for the first time could never have been properly inquired into. I can only say, that I trust nothing that has fallen from me, upon whom considerable responsibility has devolved in conducting this case, can be considered as reflecting in any manner upon any individuals in the majority. They have acted as it was natural they should. You will remember that the Chairman of the Commissioners, in the memorial which he thought fit to sign, which he stated was written under a little irritation, owing to causes which, I think, were wholly inadequate for the purpose, states that the suggestion which was contained in the report, to place the Tyne under some species of control, was at variance with every principle of the British Constitution, and would scarcely be received with approbation by a British Minister. "The attempt to im-
"pose such a despotism as it implies on the Tyne would be resisted by all classes
"on both sides of that river." The minority, and, I believe, all the representatives of Shields on both sides, pray you to subject them to such despotism if you see no other alternative out of the difficulties. I do not know that it is for me to go further and suggest any other matters to your consideration. The only one which occurs to me, and which I would venture to suggest, is this, which I have already done, that a Commission with general conservancy powers, looking at the local interests of this river, can never be administered by local parties alone, so long as conservancy powers of the general nature which are now exercised are entrusted to them; but that if the Tyne generally, so far as regards the dealing with the foreshore and the works to be executed is concerned, were the subject of legislation under the control of the Admiralty, I do not see any reason why a local Commission, provided the interests at each end of the river were properly balanced, and a public prosecutor provided, should not be entrusted to local parties. I throw that suggestion out in considering the peculiarities of the present case, which is not without difficulty, in the duty which lies before you in reporting and advising upon what is best to be done with respect to these interests.

Sir, I think I have now discharged my duty to the best of my ability upon the matter. I am sorry I have occupied so much time. I have only to express my thanks to every one of the Commissioners for the extreme attention with which I have been heard; and also,

Mr. Webster.

10th March 1855.

on behalf of the minority, for the attention you have given to their petition. Should any question arise hereafter in which I can be of any service to you in examining witnesses or affording any information, I shall be happy to attend you.

(*Mr. Seymour.*) In my speech I made a reference to inner walls, and said that some members of the minority were opposed to a system of inner walls. I am very anxious there should be no misunderstanding upon that point. I will just call my learned friend's attention to the following document:—"Newcastle-upon-Tyne, March 3d, 1855." Notice of motion by Mr. Straker.—"That no erections or encroachments be permitted "on the shores between the piers and the Narrows, but that the space be preserved as "a beaching ground for ships taking the harbour in distress, or for the formation of "docks."

(*Mr. Clayton.*) Here is a form of licence, which we were called upon to put in, granted by the old Corporation.

(*Mr. Webster.*) I think the question was asked before by one of the Royal Commission.

(*Mr. Seymour.*) I think not.

(*Mr. Webster.*) At all events, what I wished to have was the number of licences, and the dates at which and the persons to whom they had been granted.

Will you, Sir, allow to be inserted, in the documents that appear in the Appendix, the reply of the Admiralty to the majority, which I read. You may remember there was a letter from the Admiralty justifying the course of the minority in appealing to them.

(*Chairman.*) Certainly.

APPENDIX.

CONTENTS OF THE APPENDIX.

Page

No. 1.—Copy of a Letter from the Local Commissioners of the River Tyne to the Right Honourable Sir James Graham, dated the 3d day of June 1854 - - - 433

No. 2.—Copy of a Letter from the Local Commissioners of the River Tyne to the Right Honourable Sir James Graham, Bart. - - - - - - 435

No. 3.—Memorial to the Admiralty, from a Minority of the Tyne Improvement Commissioners - - - - - - - - - - 437

No. 4.—Letter from the Secretary to Her Majesty's Commissioners for the River Tyne to W. S. Lindsay, Esq., M.P. - - - - - - - 438

No. 5.—Letter from W. S. Lindsay, Esq., M.P. to Her Majesty's Commissioners for the River Tyne - - - - - - - 438

No. 6.—Letter from Secretary to Her Majesty's Commissioners for the River Tyne to John Clayton, Esq., Clerk to the Tyne Improvement Commissioners - - 439

No. 7.—Replies to Letter No. 6, from John Clayton, Esq., Clerk to the River Tyne Improvement Commissioners - - - - - - - - 440

No. 8*a*.—An Abstract of the Tyne Improvement Fund Account for the Year ending 9th November 1851 - - - - - - - 441

No. 8*b*.—An Abstract of the Tyne Improvement Commissioners' Account for the Year ending 9th November 1852, comprising Tyne Improvement Fund, Tyne Moorings Fund, and Tyne Piers Fund - - - - - - - 444

No. 8*c*.—An Abstract of the Tyne Improvement Commissioners' Account for the Year ending 9th November 1853, comprising Tyne Improvement Fund, River Moorings Fund, Piers Fund, Northumberland Dock Fund - - - - - 450

No. 8*d*.—Northumberland Docks at the Hayhole - - - - - 462

No. 9.—Letter to Her Majesty's Commissioners for the River Tyne from a Minority of the Tyne Improvement Commissioners - - - - - 462

No. 10.—A Memorial to Her Majesty's Commissioners for the River Tyne from the Mayor, Aldermen, and Burgesses of the Borough of Tynemouth, 24th January 1854 - 462

No. 11.—Resolution adopted at a Meeting of the South Shields Shipowners' Society, 20th January 1855 - - - - - - - - - 463

No. 12.—Two Letters addressed to the Chairman of the River Tyne Royal Commission, on the Subject of the Piers at the Mouth of the River Tyne - - - 464

No. 13.—Report by W. A. Brooks, Esq., C.E., Engineer to the Corporation of Newcastle-on-Tyne, recommending Deep Water Docks at the Mouth of the Tyne, between North Shields and Tynemouth - - - - - - - - 465

No. 14.—Report on proposed Coaling Staiths at the Low Light Shore, North Shields - 467

No. 15.—Mr. Rendel's Report to the Tyne Improvement Commissioners - - 472

No. 16.—Mr. Rendel's Report on the Hayhole Dock and Entrance Piers, River Tyne - 479

No. 17.—Report of James Walker, Esq. LL.D., F.R.S., L. & E., &c., on Entrance Piers, River Tyne - - - - - - - - - - - 480

No. 18.—Statement of Quantity of Material dredged out of the River Tyne, and of the Cost of such dredging, from 1st September 1842 - - - - - 484

No. 19.—Sunderland Navigation Act, Dredging Statement - - - - - 485

No. 20.—Journal of the Depths at Low Water on Shields Bar, with the Rise of Tide and Increase and Decrease of Water by the Pilot's Mark, taken at Spring Tides, kept by William Pearson, Ruler of Pilots - - - - - - 486

No. 21.—An Account showing the Trade of the Port of Newcastle, in the Years 1853 and 1854 - - - - - - - - - 489

No. 21*a*.—An Account showing the Trade of the Port of Hull in the Years 1853 and 1854 - 489

No. 22.—Copies of Public Notices issued by River Tyne Conservators - - - 489

No. 22*a*.—Caution to Masters of Ships and others - - - - - 490

No. 22*b*.—River Tyne Police Caution - - - - - - - 490

No. 23.—A brief Statement of Facts in favour of the Construction of a Harbour of Refuge at the River Tyne, by the Deputations from the Tyne Improvement Commissioners and the several Corporations of Newcastle-upon-Tyne, Gateshead, South Shields, and Tynemouth, the Newcastle-upon-Tyne, Shields, and Gateshead Chamber of Commerce, and the Shipowners' Societies of Tynemouth and South Shields - - 490

Page

No. 24.—Proceedings on a Deputation relative to the Construction of a Harbour of Refuge at the River Tyne - - - - - - - - - 493

No. 25.—List of the Tyne Improvement Commissioners, 1854-5 - - - - 504

No. 26.—Correspondence on the Construction of the Piers at the Mouth of the River Tyne, between the Admiralty, the River Tyne Commissioners, and James Walker, Esq., C.E. - - - - - - - - - - 505

No. 27.—Calculation of the Capacity of the Basin of the River Tyne, between the ancient Shores of the River and the Lines of River Walls; executed upon the plan of Mr. W. A. Brooks, Engineer to the Tyne Improvement Commission - - 513

No. 28.—Letter from R. Osborne, Esq., to Joseph Cowen, Esq., Chairman of the River Tyne Commissioners - - - - - - - - - 513

No. 29.—Comparative Statement, showing the Areas at High Water and the Cubic Capacity of the River Tyne at High and Low Water, as computed from Surveys made in the years 1813, 1849, and 1854 - - - - - - - - - 514

No. 30.—List of Plans of the River Tyne and Documents connected therewith, produced for the Information of Her Majesty's Commissioners during the Inquiry - - 518

Appendix No. 1.

Copy of a Letter from the Local Commissioners of the River Tyne to the Right Honourable Sir James Graham, dated the 3d day of June 1854.

To the Right Honourable Sir James Graham, First Lord of the Admiralty.

Sir,

We, the undersigned Commissioners for the Improvement of the river Tyne, feel constrained to bring under the notice of the Lords of the Admiralty the following circumstances connected with the management of this most important navigation.

We would remind you of the Act of 1850, by which the conservancy of the river was transferred from the corporation of Newcastle to a mixed commission, representing that corporation and those of Gateshead, South Shields, and Tynemouth (North Shields), with four Life Commissioners named in the Act, eighteen in all. By the Act it was also provided that the present town clerk and treasurer of the corporation of Newcastle should be respectively the clerk and treasurer to the Commissioners.

The neglect and mismanagement of the river previous to 1850, which induced the Lords of the Admiralty to support the abolition of the exclusive conservancy of Newcastle, are referred to in the following extract from the report of Messrs. Abernethy and Lawes, Admiralty Inspectors:

"The principal features of the plan proposed by the late Mr. Rennie, in 1813, appear to us to have been judicious, and that they must, in the main, govern any future works for the effectual improvement of the river. He proposed to make such alterations in the navigable channel of the river as would tend to equalize its sectional area, and thereby the velocity of the current, and to add to the volume of tidal water by providing additional depth of channel wherever its sectional area would be lessened by any contraction in its breadth.

"That plan, however, according to the evidence which has been adduced before us, does not appear to have been acted upon; and we think that the works which have been executed from time to time have been based upon erroneous principles. The existing channel is still irregular and tortuous, whilst its capacity has been lessened by embanking to a considerable extent, without an equivalent being provided for the reduction of the sectional area.

"In corroboration of this statement, we need only refer to the very valuable evidence given by Mr. Calver, from which it appears that the volume of water in the channel of the river between Newcastle Bridge and the sea, at high-water, has diminished, since 1813, from 940,883,000 to 898,116,000 cubic feet, being a loss of 42,767,000; whilst the capacity of the channel at low-water has diminished from 214,262,000 to 205,756,000 cubic feet, being a loss of 8,506,000, thus making the total diminution in the quantity of tidal water no less than 34,261,000 cubic feet at each tide.

"These are startling results, especially when taken in connexion with the fact that the depth in the navigable channel generally has not been increased, and that the entrance to the river is mainly dependent upon the volume of water passing over the bar."

It might have been expected that the new conservators, when they entered upon their office, would have commenced to repair the mismanagement and avoid the example of their predecessors.

But the Commissioners have persisted in the very same pernicious system of engineering. Up to the change in the conservancy, the tidal area of the Tyne had been diminished to the extent of ninety-five acres, by encroachments unnecessary and injurious to the river, as is becoming every day more apparent, and carried out upon no uniform line; encroachments, however, of immense value to the owners of the adjoining river-side estates.

This diminution of tidal water is a reduction of the scouring power which maintains Shields harbour and the navigable depth over the bar. The bar is the key to the whole navigation, and its good condition is of public and national importance. By the encroachments of which we complain, a daily increasing injury is being done, which cannot be repaired. The ground abstracted from the side of the river forms valuable sites for manufactories, and is readily let at high rents on long leases by the corporation of Newcastle, in front of whose estates the encroachments have been principally made; and when once the land has been covered with valuable erections, its restoration to its former state is hopeless.

The Commissioners connected with Newcastle and Gateshead have a majority of votes in the Board over those connected with Shields. The two first-mentioned towns form practically one interest, and their influence in the Commission has been used to perpetuate and extend the system of engineering referred to.

On many occasions we have brought forward the continued mismanagement of the river, by motions directed to the abandonment of the unsound and ruinous system of engineering which has been practised.

We have opposed the alienation of the foreshore of the river—which we consider to be the freehold of the public—to the adjoining proprietors, corporate or individual, but we

Appendix No. 1.

have uniformly been outvoted by the Newcastle Commissioners, sometimes by the narrowest majority.

We cannot tell in precise figures how much the Tyne has been encroached upon during the three years and a half that the Commission has been in operation.

A return, moved for by Captain Purdo, R.N., to show this, was refused by the majority of the Board, avowedly from a dread lest the information should reach the Lords of the Admiralty.

Nor can we tell the precise extent to which the navigable depth of the Tyne has deteriorated.

But we know that the main channel of Shields harbour is worse, and that the Commissioners are constantly importuned to send the dredger to shipping places on both sides the river, which are gradually and rapidly shoaling.

We are confident that, although Mr. Calver's survey of 1849 showed a great deterioration in the river as compared with 1813, the full effects of the encroachments had not then appeared, and that a re-survey of the river now would show a very rapid deterioration in the past five years.

In short, the system followed by the corporation at first, and by the Commission since, has been to reduce the size of the Tyne without increasing its depth, to endanger Shields harbour and the bar, and to increase the estates of the adjoining landowners at the cost of the public freehold of the Tyne.

The dredging operations (which cost three times as much as at Sunderland, because instead of sending the dredged material to sea, the Commissioners have insisted in using it in making land for the corporation and others) are carried on, not to form new progressive improvements, but are mere partial and irregular attempts to remedy the effects of previous unsound and unskilful engineering.

Although the majority of the Commissioners have rejected every motion for the adoption of a sound and consistent principle of engineering, they have met these motions by a simple negative, and have never laid down for themselves any progressive and foreseeing line of river operations, isolated cases only being taken up as they accidentally arise.

Meanwhile, the ballast dredged from the bed of the Thames is deposited in the bed of the Tyne; the full-tide cross jetties are allowing a gradual elevation of the sides of the river; the materials raised by the spasmodic dredging operations at various places where new shoals have grown up, are deposited also below high-water mark.

The process of encroachment by these means is in rapid progress, and we calculate that, with the enormous encroachment upon Jarrow Slake contemplated by the York, Newcastle and Berwick Railway Company, the river Tyne will be found reduced within a few years to three-fourths of its original area.

So great a reduction must inevitably injure the berthage of ships in Shields harbour, as well as the bar.

The only possible remedy now available is the immediate abolition of the present system of cross-jetties and full-tide embankments; the rigorous enforcement of the principle that every new embankment, whether for docks or otherwise, should be compensated for directly by a proportionate amount of excavation, to be made and maintained, as a receptacle for the excluded tidal water; the immediate discontinuance of the deposit of ballast or dredged materials within any part of the tidal flow; and, lastly, the execution of a carefully designed comprehensive system of works for training the river, founded on the principle of encouraging the tidal flow, and increasing the tidal capacity of the river.

Such a system was laid down by Mr. Rennie in 1816, and should now be carried out under the responsibility of some eminent engineer, who would possess the confidence of the Lords of the Admiralty and of the public.

As an illustration of the still existing conflict of Newcastle interests with the river, we would refer to the proceedings of the last monthly meeting of the Board, where a motion brought forward by us for the immediate abandonment of the present practice of systematically excluding tidal water by embankments on the foreshore, was defeated by the casting vote of the mayor of Newcastle, who occupied the chair; and at the same meeting the clerk to the Commissioners, in his capacity of town clerk of Newcastle, informed the Commissioners that the corporation claimed the ownership of all the foreshores of the Tyne, and would therefore refuse to render any account of the monies received still by the corporation as annual acknowledgments for licences of jetties and other projections into the tideway, which the Commissioners had demanded, considering themselves entitled to these acknowledgments as the present conservators of the river. And there are numerous other instances in which the interests of the river and those of Newcastle are at variance, while both the corporation and the Commissioners have the same confidential legal adviser.

If the Tyne were now suffering merely from neglect by the useless expenditure of its fund, or by waste of time in commencing active operations for its improvement, it would even in that case be a matter deserving the attention of the Lords of the Admiralty; but when the most important river and harbour on the north-east coast is not merely suffering from neglect, but is daily undergoing serious deterioration in its navigable and tidal capacity, and when an unsound system is being persisted in, the ruinous results of which we feel will more distinctly than ever yet appear, we must bring before their Lordships the urgency of the case.

Appendix No. 1.

As a most important practical step, we would respectfully press upon them the necessity of their ordering a fresh survey of the Tyne, or of such portions of it as are alleged to have become worse, to be made forthwith, in order that the further results of the past five years may be clearly exhibited, and made manifest beyond dispute.

We have, &c.

(Signed) Wm. Purdo,
Retired Commander, R.N.,
James C. Stevenson,
William Linskill,
M. Poppelwell,
Jno. W. Lamb,
Joseph Straker,
River Tyne Commissioners.

3 June 1854.

No. 2.

Appendix No. 2.

Copy of a Letter from the Local Commissioners of the River Tyne to the Right Honourable Sir James Graham, Bart., First Lord of the Admiralty.

Sir, Newcastle-upon-Tyne, 20 July 1854.

A Letter addressed to you as First Lord of the Admiralty by six of the 18 Tyne Improvement Commissioners, dated the 3d of June last, moved for in the House of Commons on the 20th of the same month, by Mr. Lindsay, the Member for Tynemouth, and printed amongst the proceedings of the House, has been this day taken into consideration at a meeting of the body of Commissioners, in whose name I have now the honour to address you.

On the propriety of the course these gentlemen have taken I shall make no comment, but proceed to refute the allegations and assumptions, wholly unwarranted by facts, which they have circulated. It will be necessary that I should at the same time advert to a Report of Mr. Edward Killwick Calver (a surveyor in the employment of the Admiralty), which Report, on the motion of the same Mr. Lindsay, was ordered by the House of Commons to be printed on the 16th day of the same month of June.

The Commission to which the Legislature has confided the conservancy of the River Tyne, is formed on the representative system. The Corporation of Newcastle return six of its members; the Corporation of Tynemouth (North Shields) three; the Corporation of South Shields, three; the Corporation of Gateshead, two; and four Commissioners are named in the Act, making eighteen in the whole. The Act of 1850, by which the conservancy was established on its present footing, was the result of a compromise with the Corporation of Newcastle, the former conservators.

The main object of the letter of the 3d June, addressed to you by six of the Commissioners, as will hereafter appear, was to obstruct the progress of a Bill for the formation of a dock on Jarrow Slake (a bay on the south side of the Tyne, and within the borough of South Shields), a work which must contribute much to advance the interests of that borough, and must greatly benefit the general commerce of the Tyne, by affording a convenient place of shipment for large quantities of coal, now shipped at Sunderland and other inferior ports.

The six gentlemen signing the letter to you are Captain William Purdo, a resident at Sunderland; Mr. James Cochrane Stevenson, a manufacturer, occupying with his manufactory, or its appendages, a portion of Jarrow Slake, being two of the Commissioners appointed by the Act of 1850; the three Commissioners elected by North Shields, and one of the three Commissioners elected by South Shields. We impute no motives, but we cannot conceal from ourselves, or from you, that such is the position of the several parties signing this letter.

These gentlemen tell you that "up to the change in the conservancy, the tidal area of the Tyne had been diminished to the extent of ninety-five acres;" they omit, however, to say, that the advice of the late Mr. Rennie was, that it should be diminished to the extent of 448 acres.

They tell you, on the authority of Mr. Lawes, a barrister, Mr. Abernethy (an engineer of whom we never heard as having had any experience in the management of navigable rivers), and of Mr. Calver, the surveyor above named, "that the encroachments, by which "the channel of the river has been sought to be deepened and improved, are unnecessary "and injurious to the river, and that the works have been based upon erroneous principles;" but they do not tell you what are the opinions on this subject of the most eminent engineers of the day, of Cubitt, of Rendel, and of Stephenson. Sir William Cubitt, in his evidence before the House of Commons, expressed his entire approbation of the whole of the works complained of; and Mr. Rendel, speaking with that caution for which he is distinguished, thus expressed himself: "generally speaking, I have not the slightest "grounds for objecting to the lines which have been adopted, but there may be some cases "in which, if the thing were to be gone over again, some alterations might be suggested, "but they would be very trivial."

The Commissioners are charged with having rejected the motions of the gentlemen signing the letter, directed (as they are pleased to state) to the abandonment of the "unsound and ruinous system of engineering which has been practised." The fact is,

Appendix No. 2.

that the majority of the Commissioners have repudiated the quackery of amateur engineers, and have acted on the opinions of the first engineers of the day.

The Commissioners are accused, by implication, of sacrificing the interests of the river confided to their care, for the sake of increasing the estates of the neighbouring landowners; and Mr. Calver, in language which no doubt has been reproved by his employers, deals in insinuations against individuals of high honour and integrity. On the part of the Tyne Improvement Commissioners, I can with truth say that, since they came into office, they have not sanctioned the inclosure of any portion of the foreshore of the river Tyne, unless in cases where such inclosure was obviously for the benefit of the navigation.

The title to the soil of the Tyne is at present the subject of contention, and will be decided by the legal tribunals of the country, by which alone it can be properly decided. The Tyne Improvement Commissioners can however have no title to it. They take their property by transfer from the Corporation of Newcastle, and the soil of the river is expressly reserved to the Corporation in that transfer. The Commissioners are accused of having refused a return moved for by Captain Purdo, to show how much the Tyne had been encroached upon during the three years and a half that the Commission had been in operation. Captain Purdo made no such motion; he moved for a return of encroachments since the year 1840, which would have been both useless and expensive.

The effects which the six gentlemen signing the letter ascribe to the acts of the conservators of the Tyne have no foundation in fact. It is not true, as they state, that the navigable depth of the Tyne is diminished; on the contrary, the sailing channel is now so much improved, that vessels which could formerly navigate the river only at spring tides, can now navigate it at neap tides.

It is not true, as they state, that the main channel of Shield's Harbour is worse; on the contrary, it is decidedly improved, both by the diminution of Droitwich Sand and of the Insand, and the depth of water on the bar has been increased.

All these assertions and all these imputations are, however, a mere preface to the main object of the writers of the letter, namely, to prevent if possible the Bill for the formation of docks on Jarrow Slake by the York, Newcastle, and Berwick Railway Company receiving the sanction of the Legislature. They develop their views as to these docks in the following paragraph: "The process of encroachment by these means is in rapid "progress, and we calculate, that with the enormous encroachment upon Jarrow Slake "contemplated by the York, Newcastle, and Berwick Railway Company, the river Tyne "will be found reduced within a few years to three-fourths of its original area."

At the time when this letter was written, a Bill was before Parliament, which has since passed into law, to enable the York, Newcastle, and Berwick Railway Company to form docks at Jarrow Slake of an extent to accommodate 500 ships, and calculated, in the opinion of the most eminent engineers, to benefit the general navigation of the river.

The opinion of Mr. Calver was opposed to these docks; but select Committees of both Houses of Parliament, by unanimous decisions in favour of them, have testified their sense of the value of Mr. Calver's system of engineering.

The Corporation of Newcastle, to whom the right to the soil of the river was reserved in the Act of 1850, have been in the habit of requiring small pecuniary acknowledgments from individuals, for the use of portions of the bed or soil of the river. At a recent meeting of the Commissioners, Mr. James C. Stephenson moved that an application be made to the Corporation of Newcastle for an account of these receipts; to which the Corporation replied, that inasmuch as the soil of the river in respect of which these payments were made was expressly reserved to them, there was no use or propriety in rendering to the Commissioners an account of them. The whole amount of these annual payments is 14*l.* 10*s.*

The statement contained in the letter of the six Commissioners, that "there are numerous instances in which the interests of the river and those of Newcastle" are at variance, is utterly unfounded. The town of Newcastle, situated in the higher part of the navigation, and containing nearly 100,000 inhabitants, has the largest and deepest interest in the river Tyne and its navigation, and in the success of the operations of the Commissioners. Inasmuch as the Town Clerk of Newcastle and the Treasurer held their offices at the time of the passing of the Municipal Reform Act, and were entitled to compensation if displaced (which compensation would have been under the Act of 1850 a charge upon the Commissioners), it was obviously the more economical and the most beneficial course, that they should be continued in their offices under the Commission.

The report of Mr. Edward Killwick Calver concludes with the suggestion of an extraordinary remedy for all the evils complained of, namely, "that the Tyne, with the other northern "ports from Whitby to Blythe inclusive, be placed under an acting conservator, and be "subjected to the strictest periodical supervision, such party being responsible to their "Lordships (that is, the Lords of the Admiralty) only." Such a suggestion, at variance as it is with every principle of the British Constitution, would scarcely be received with approbation by a British Minister. The attempt to impose such a despotism as it implies on the Tyne, would be indignantly resisted by all classes on both sides of that river.

I have, &c.

(Signed) Jos. Cowen,
Chairman of the
Tyne Improvement Commissioners.

The reply from the Secretary of the Admiralty to the above letter will be found in Appendix No. 28.

No. 3.

Appendix No. 3.

MEMORIAL to the ADMIRALTY from a Minority of the TYNE IMPROVEMENT COMMISSIONERS.

To the Secretary of the Admiralty.

SIR,—We deem it unnecessary to remind the Lords of the Admiralty of the great national importance of the harbour and navigation of the Tyne; and we would without any preface bring before their attention the system of management now followed by the Tyne Improvement Commission, of which body we are members.

We would refer their Lordships to a letter which we, on the 3rd June last, addressed to the First Lord, for a statement of the facts regarding the system of river management, pursued first by the Corporation of Newcastle, and since 1850 by the Tyne Commission, the constitution of which body practically continues to the Corporation, and to some extent to the same individuals, the control of the river.

In answer to that letter, the Chairman of the Commissioners, in the name of the Board, or rather of the majority, has addressed a letter to Sir James Graham. We do not think it necessary to advert to the personalities and imputed motives regarding us which that letter contains, and which we most decidedly repudiate.

The letter alleges that the encroachments on the tidal area of the Tyne, of which we complained, were founded on and have partially carried out the advice of the late Mr. Rennie, "that it should be diminished to the extent of 448 acres." Such an allegation displays the most lamentable ignorance of the principles and operations laid down in the very valuable report of that eminent engineer, and illustrates a remark by Mr. Calver, R.N., in his report of the 17th of December last, that the members of the Board are "generally unacquainted with the matters on which they are called upon to deliberate."

The embankments proposed by Mr. Rennie to bound the sailing channel were restricted to a little above half-tide height, in order, as he says, that "a principal part of the space embanked will still remain as a receptacle for tidal water;" and, in opposition to contracting the river by solid embankments, he states that "as a less quantity of tide water would thereby be admitted, it would have less effect in keeping down the bar;" and again, "a great extent of space to receive tide water is essential to the maintenance of a good outfall." Mr. Rennie's report remained neglected by the conservators of the river, and it was nearly thirty years before any river works were commenced, and these works have been carried out on the very opposite principles of tidal economy. In his report to the Commissioners in 1851, Mr. Rendel advanced the same principles as Mr. Rennie regarding tidal water; but the system of solid embankments and high water transverse jetties is still persevered in by the majority of the Board. So far from having "acted upon the opinions of the first engineers of the day," there is no consulting engineer responsible for the encroachments which the Commissioners are carrying on, Mr. Walker's responsibilities as consulting engineer being confined to the piers in the sea.

The Chairman asserts that the "sailing channel is now so much improved that vessels, "which could formerly navigate the river only at spring tides, can now navigate it at neap "tides." This is a great exaggeration. But we do not deny that by means of steam, vessels can navigate with somewhat greater draught of water the violently contracted channels caused by the jetties; but we maintain that the navigable capacity (depth and breadth combined) has very much deteriorated. The dredger has very lately been employed in endeavouring to restore the sailing track through a *new shoal*, which has sprung up directly opposite Messrs. Palmer's Encroachment, where the rising of the bed of the river has followed the extensive embanking of both sides, and its contraction to less than two-thirds of its original width.

It is now of greater importance than ever that there should be a stop put to the present system of embanking estates from the river bed. But the advocates of the system have taken courage by the extent to which it has been permitted to go on unchecked, and these encroachments may be expected to proceed now more vigorously than ever.

And as they proceed the decay of the Tyne will proceed likewise. The "Narrows" at the lower end of Shields harbour are now narrower than ever, and it is only by the aid of steam tugs that the entrance and departure of ships is generally practicable; and while the bar remains of fluctuating depth, its navigable width seems permanently reduced.

For the importance of Shields harbour, in respect of refuge and berthage, we would refer their Lordships to the "Statement of facts" in favour of making the Tyne a harbour of refuge, laid before their Lordships by the deputations of the Tyne Commissioners, and several municipal and other local bodies.

Yet it is these valuable qualities of the Tyne that will, we firmly believe, be destroyed, if the whole amount of enclosure now avowedly in contemplation be carried out. We estimate the ultimate loss of tidal area at between 700 and 800 acres, out of the original area of 1,694 acres between Shields Narrows and Newcastle Bridge, or above one-third of the whole scouring acreage of Shields harbour. The deep water berthage of Shields harbour seems to us unquestionably due to its contracted width naturally, compared with the great expanse of Jarrow Slake and the upper reaches of the river, and the effect of making the river of one uniformly contracted channel, must be to make Shields harbour of the same uniformly shoal depth which prevails in the upper navigation.

Appendix No. 3.

This total change in the geographical features of the estuary of the Tyne, involving as it does consequences so disastrous, ought not to be permitted without the fullest inquiry and the consent of the Admiralty, as supreme conservators on behalf of the national interests at stake.

We feel that the importance of the crisis demands the fullest inquiry—and we would strongly urge upon their Lordships the propriety of procuring the appointment of a Royal Commission to inquire into the facts of the case, into the extent which the interests of the Corporation of Newcastle and other landowners are at variance with the interests of the navigation, into the constitution and operation of the Commission for the Improvement of the Tyne, and the necessity of a better representation within the Commission, or of a control by a central authority over the acts of the Commission, on behalf of the national interests which are imperilled in the management of so important a navigation. And considering that the process of encroachment is going on day by day, and that these encroachments can never be restored when once made, and that no money compensation can ever be an equivalent for the ultimate injury, we could further suggest to their Lordships to take without delay any legal or other proceedings within their power, to arrest further encroachments until the repetition of the abuse shall have been secured against for the future.

William Purdo, R.N.,
James C. Stevenson,
William Linskill,
M. Poppelwell,
Jno. W. Lamb,
Joseph Straker,
River Tyne Commissioners.

Port of Shields, August 3d, 1854.

No. 4.

Appendix No. 4

Letter from the Secretary to Her Majesty's Commissioners for the River Tyne to W. S. Lindsay, Esq., M.P.

River Tyne Commission,
18, Great Queen Street, Westminster, 5th Dec. 1854.

Sir,

Her Majesty having been pleased in compliance with an address from the House of Commons to issue a Royal Commission for the purpose of inquiring into the present state of the River Tyne, and "whether the encroachments on the tidal waters of that "river by jetties, embankments, and other works executed and proposed on the banks "thereof have not injured the navigation, and will not continue to counteract the plans for "removing the sand banks at the mouth of theriver, and otherwise injure the navigation "of that important river,"—and as it appears by the Journals of the House of Commons that you were the mover of the Address in question, I am directed by the Commissioners appointed by Her Majesty to conduct the said inquiry to request that you will favour them with such information with respect to your views and opinions on this subject as may be necessary to guide and direct their proceedings, and also furnish them with the names of any persons whom you would wish to bring forward as witnesses.

I am at the same time directed to remind you that three very long and careful investigations on this subject have lately taken place under the directions of the Board of Admiralty (before Captain Washington, R.N., in 1849; Messrs. Lawes and Abernethy, in 1850; and James Walker, Esq., in 1852); that the conservancy of the Tyne has recently been reconstructed by an Act of Parliament (15 July 1850); and that during the last Session the question came under the consideration of Committees of both Houses (Select Committees on the York, Newcastle and Berwick Railway (Construction of Docks, &c.) Bill, Commons, 10th May 1854; Lords, 24–26th June 1854), thus placing on record a large mass of evidence applicable to the present occasion.

I am, &c.
(Signed) Frederick. John Evans, R.N.
Secretary to the Commission.

No. 5.

Appendix No. 5.

Reply to Letter Appendix No. 4 from W. S. Lindsay, Esq., M.P.

Sir,

17, Portland Place, 20th December 1854.

In reply to your letter of the 5th instant, I think the points of inquiry should be:

1st. The past and present condition of the Tyne river.

2d. The nature and effects of the works carried out of late years on the plea of river improvement.

3d. The constitution of the Tyne Improvement Commission.

4th. The necessity of some better representation in the Commission of the national interests at stake in the management of the Tyne, or better control over the Commission on behalf of these interests.

5th. The revenues contributed by the trade of the Tyne, and their appropriation.

Appendix No. 5.

And I would wish the attention of the Commissioners appointed by Her Majesty to be particularly directed to the most important fact, that the Tyne Commission as constituted by the Act of 1850 has *not* carried out the intentions of the Legislature, inasmuch as the Corporation of Newcastle continues to exercise a preponderating amount of influence within the Commission, arising in a great measure from the circumstance that the shipowners and inhabitants of Shields were *compelled* to submit to a compromise, and to assent to the Town Clerk of the Newcastle Corporation, and the engineer of that Corporation, continuing to act for the Commission. To counteract that preponderating influence, which they felt was injurious to the best interests of the river Tyne, the people of Shields spent in the *two years contests*—but spent, I fear, in vain—many thousand pounds sterling, which were raised entirely by private subscription, varying in amount from 2*s.* 6*d.* up to 200*l.*

Intimately connected as these two officers (Messrs. Clayton and Brooks) are with the Corporation of Newcastle, the independent action of the river Commissioners is considerably trammelled; and I regret to add that the encroachments on the foreshore, and the misapplication of the public funds, which led to the transfer of the conservancy in 1850, appear to be now carried on with even greater vigour than ever. These facts you will find borne out by reference to the various reports and documents named in your letter, and they will, I expect, be more clearly elucidated by the evidence which will be brought before the Royal Commissioners.

As you request me to name those whom I would desire to have examined as witnesses, I would suggest, if agreeable and convenient for these gentlemen to attend, that the evidence of the following be taken:

Admiral Beechy, Board of Trade;
Captain Washington, R.N., Admiralty;
Lieutenant Calver, R.N.;
M. Popplewell, Esq., North Shields;
Wm. Linskill, Esq., Ditto;
Commander Purdo, R.N., South Shields;
Jas. C. Stevenson, Esq., Jarrow;
John W. Lamb, Esq., Newcastle;
Joseph Straker, Esq., Ditto;

and John Ure, Esq., engineer to the Clyde River Trust, a gentleman of considerable practical experience in the management of rivers.

As it will be found on evidence, as I have stated, that the *Inland* towns of Newcastle and Gateshead have a majority of members in the Commission, and, as might naturally be supposed, they would never consent to that Commission's being remodelled, I would venture to suggest the desirability of having a separate Conservancy Board for the Port of Shields; but at the same time I should desire that the Conservators of both Shields and Newcastle be effectually controlled by the *Board of Trade* or *Admiralty*. This would indeed be necessary, so as to check and control local influences, to maintain that harmony so essential to good management, and to see that the attention of the Conservators is directed, and the funds levied applied, *solely* to the maintenance and improvement of that very important river.

In conclusion, I think it right that I should direct your attention to the evidence given by Mr. Stevenson before the Shipping Dues Commissioners of North Shields, in September 1853, relative to the misapplication of the funds raised by the Tyne Commission, and to which you may be pleased to refer.

It may be hardly necessary for me to state that, in my opinion, Mr. Brooks, the engineer to the present and former Conservators, should be called upon to furnish an account *in detail*, setting forth all the works executed by him since November, 1850; the situation of those works; the cost of each; besides a note of the whole expenditure under his direction since 1850 till the present date.

As you may be a stranger to the locality, I hope it may not appear out of place in my adding, that from the convenience of the railway in communication with Shields and Newcastle running every half hour, it strikes me that *Tynemouth*, or the upper part of *North Shields* (where a good room can be had), may be found the most pleasant and convenient place for the Royal Commission to hold its sittings.

I am, &c.

(Signed) W. S. Lindsay.

Frederick John Evans, Esq.,
Secretary to River Tyne Commission.

No. 6.

Appendix No. 6.

Letter from Secretary to Her Majesty's Commissioners for the River Tyne to John Clayton, Esq., Clerk to the Tyne Improvement Commissioners.

Sir, 18, Great Queen Street, Westminster, December 5, 1854.

Her Majesty having been pleased, in compliance with an address of the House of Commons, to issue a Royal Commission for the purpose of inquiring into the present state of the River Tyne, "whether the encroachments on the tidal waters of that river by "jetties, embankments, and other works executed and proposed on the banks thereof have

Appendix No. 6

" not injured the navigation, and will not continue to counteract the plans for removing " the sand banks at the mouth of the river, and otherwise injure the navigation of that " important river ;"

I am directed by the Commissioners appointed by Her Majesty to conduct the said inquiry to enclose a copy of the Commission, and to request that you will be pleased, after convoking a special meeting of the Improvement Commissioners to receive this communication, to acquaint me, for the information of the Commissioners, with such particulars as to the present state of the navigation of the Tyne, as may appear to you most interesting and important, and especially,—

1st. Whether the Board of Improvement Commissioners, since its reconstruction in 1850, has worked efficiently ?

2d. What works are now in progress for the improvement and deepening of the River Tyne ?

3d. The annual income and expenditure for the above purpose, with its application in detail ; and that the replies to these questions may be accompanied by such further observations as may be thought necessary by the Board.

I am further directed to say that, if any difference of opinion should be found to exist amongst the Improvement Commissioners on this subject, the Commissioners request that the dissentients will state their sentiments in a separate letter, a copy of which should be communicated to their colleagues.

I am, &c.
FREDK. JNO. EVANS, R.N., Secretary.

Appendix No. 7.

No. 7.

REPLIES to LETTER Appendix No. 6, from JOHN CLAYTON, Esq., Clerk to River TYNE IMPROVEMENT COMMISSIONERS.

SIR, Newcastle-upon-Tyne, December 8, 1854.

I have the honour to acknowledge the receipt of your letter of the 5th instant, which shall be laid before the Commissioners of the River Tyne, at a meeting to be held for the special purpose of receiving it, next week.

I have, &c.
Frederick John Evans, Esq. JOHN CLAYTON.

SIR, Newcastle-upon-Tyne, January 11, 1855.

I have the honour to reply to the three questions proposed in your letter of the 5th ultimo.

To the 1st. The Board of Tyne Improvement Commissioners, since its reconstruction in 1850, has worked efficiently.

To the 2nd. The works now in progress for the improvement and deepening of the river Tyne consist, firstly, of the works which have been sanctioned by the Legislature, viz., the piers at the mouth of the Tyne; the Northumberland Dock at the Hay Hole, on the north side of the river, which gives a new river frontage for upwards 4000 feet on the line recommended by Mr. Rennie ; and the Jarrow Dock on the south side of the river, which gives a new river frontage for upwards of 1800 feet, likewise on the line recommended by Mr. Rennie. All these works are in the course of being executed under Acts of Parliament, the two first by the Commissioners, and the last by the North Eastern Railway Company. And secondly, of those works which the Commissioners are prosecuting under their general powers for deepening and improving the river, viz., the removal by means of a powerful dredger of what remain of the stones or nine-feet bar near the mouth of the river ; the formation of a half-tide wall on the line recommended by Mr. Rennie on the south side of the river, extending for upwards of 6000 feet along the shores of Hebburn ; the completion of the river wall in the Wallsend Bight on the north side of the river, commenced by their predecessors, the late conservators ; and the general dredging of the river.

The Commissioners contemplate a further removal of Bill Point, and the removal of the obstructions in front of Whitehill Point, so soon as the docks on both sides of the river shall have been completed ; and, in case a satisfactory arrangement can be made with the corporations of Newcastle and Gateshead, the removal of Newcastle bridge.

To the 3rd. The third question is best answered by the transmission of copies of the accounts of the Commission since its establishment.

I have, &c.
Frederick John Evans, Esq. JOHN CLAYTON.

P. S.—It is proper that I should add to the above letter a statement of the fact, that such letter was read and approved at a meeting of the Tyne Improvement Commissioners held to-day; that there were fifteen Commissioners present, nine of whom voted in favour of the resolution approving of the letter, four voted against it, and one declined voting at all.

The four dissentients did *not* communicate to their colleagues a copy of a separate letter containing their sentiments; and until they do so, the Board of Commissioners must reserve their further observations.

Dr. AN ABSTRACT of the TYNE IMPROVEMENT FUND ACCOUNT, for the Year ending 9th November 1851. *Cr.*

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To ballast dues for depositing and conveying ballast	8,416 11 3		By ballast dues, for conveying ballast, viz.:—		
To harbour dues on ship and boat	1,949 6 8			TONS.	
To dues on commodities brought in as ballast	757 16 4		R. W. Swinburne and Co. *South Shields*	11,268 at 11½*d.* per ton	539 18 6
To town dues on coals, cinders, &c., three-eighths of the amount collected	3,829 2 4		Thomas Salmon *South Shields*	13,083	
To ballast office dues on ships	1,418 7 5		Corporation of Newcastle *Bill Point*	222	
To groundage and plankage dues	238 4 10		Corporation of Newcastle *Walker*	3,580	
		16,609 8 10		16,885 at 10*d.* per ton	730 10 10
To ballast warrants	-	347 0 0	E. K. Fairless *Jarrow*	11,229	
To quay and town dues	1,192 5 10		George Hudson, Exors. of John Chambers *South Shields*	16,677	
To do. do. for the quarter ending 10th October 1851, in course of collection	673 8 0			27,906 at 9*d.* per ton	1,046 9 6
		1,865 13 10	Corporation of Newcastle *Willington*	28,341	
To dredging machine and river craft:			Corporation of Newcastle, *Walker*, by Keels	2,704	
For use of dredger	291 5 3		Owners of the colliery *Seghill*	87	
For use of weigh keel	20 7 6		Corporation of Newcastle *Heaton*	6,249	
		311 12 9	Owners of the colliery *Cramlington*	1,084	
To Howdon property, for rents	-	464 7 7		38,465 at 8*d.* per ton	1,282 3 4
			Joseph Mordue *Wallsend*	8,964 at 6*d.* per ton	224 2 0
			Total	103,488	3,766 4 2
			By dredging machine and river craft:—		
			For amount of expenses dredging in the river (as per engineer's pay bills)		2,373 2 4
			For repairs to new craft, boathouse, &c.		143 0 9
					2,516 3 1
			For goods furnished for the dredger and river craft, for amount unpaid and outstanding on the 9th November 1851		539 0 11
					3,055 4 0
			By river improvement account, for amount of expenses of river works, at the following places (as per engineer's pay-bills), viz.:—		
			At Walker		844 10 6
			„ Wallsend		67 17 3
			„ Willington		116 18 5
			Engineer's small expenses		29 14 6
					1,059 0 8
			Goods for the above works, viz.:—stone, timber, iron, &c., paid to the Corporation of Newcastle (per agreement)		245 19 6
					1,305 0 2
			By dues on coals, cinders, &c.:—		
			For commission collecting reciprocity dues on coals, paid to the Trinity House, London		- - 20 5 3
			By quay and town dues:—		
			By amount paid to the benevolent fund for particulars of cargoes		- - 28 17 0
Forward	- - £	19,598 3 0	Forward		- - £ 8,175 10 7

Dr. Abstract of the Tyne Improvement Fund Account, for the Year ending 9th November 1851—*continued.* Cr.

	£	s.	d.		£	s.	d.	£	s.	d.
To amount brought forward	19,598	3	0	By amount brought forward				8,175	10	7
				By port and harbour charges :—						
				For the harbour master's disbursements at *Newcastle*, for boatmen's wages, for cleaning drains, and small expenses	165	11	3			
				For the harbour master's disbursements at *Shields*, for office rents, repairs of boats, painting, printing, and other expenses	129	3	3			
				For the collector of quay and town dues, for small expenses	3	0	7			
				For stationery	6	3	6			
				For one-third of maintaining the river police, to 31st December 1850, paid to the river mooring fund	44	12	10			
								34	11	5
				By salaries, (for amount of salaries paid,) as under, viz. :—						
				W. A. Brooks, engineer, from 9th November 1850, to Michaelmas (29th September) 1851, at 350*l.* per annum	307	13	10			
				Robert Pinkney, ballast office clerk, from and to the same time, at 200*l.* per annum, (being two-thirds of 300*l.* per annum	175	16	6			
				Simon Danson, quay and harbour master, Newcastle, from and to the same time, at 175*l.* per annum	153	17	0			
				Jacob Danson, ballast inspector, from and to the same time, at 150*l.* per ann.	131	17	5			
				William Wake, harbour master at North Shields, from and to the same time, at 150*l.* per annum	131	17	5			
				Lawson Dunn, ballast assessor, South Shields, from and to the same time, at 100*l.* per annum	87	18	3			
				Lancelot Elliot, harbour master, South Shields, from and to the same time, at 100*l.* per annum	87	18	3			
				Joseph Salkeld, ballast master at Willington, from and to the same time, at 65*l.* per annum	57	2	10			
				Robert Pinkney's two assistants, from and to the same time, at 80*l.* per annum (being two-thirds of 120*l.* per annum)	70	6	8			
				Robert Forster, assistant to the harbour master at Newcastle, from and to the same time, at 60*l.* per annum	52	15	0			
				George Clark, assistant collector of quay and town dues, from and to the same time, at 50*l.* per annum	43	19	2			
				Ann Dixon, ballast office messenger, from and to the same time, at 30*l.* per annum	26	7	6			
				R. P. Bell, collector of port dues at Shields, from and to the same time, at 46*l.* 13*s.* 4*d.* per annum, (being two-thirds of 70*l.* per annum)	41	0	6			
				Ballast inspector's two boatmen, 52 weeks at 20*s.* each per week	104	0	0			
				William Wake, harbour master, North Shields, for his nine boatmen, from 9th November 1850, to 31st October 1851 :—						
				50 Weeks, viz., 3 at 22*s.* each - 165 0 0						
				Ditto 6 at 20*s.* each - 300 0 0						
					465	0	0			
				William Wake, for messengers with ballast warrants, for the same period, 1735 warrants, at 2*s.* each	173	10	0			
				John Clayton, clerk to the commissioners, from 9th November 1850, to Midsummer (25th June) 1851, at 140*l.* per annum, (being a quarter of 560*l.* per annum)	88	1	6			

				William Armstrong, treasurer, from 9th November 1850, to Michaelmas 1851, at 100*l.* per annum, (being a quarter of 400*l.* per annum)		87 18 3	
				William Williams, collector of customs, Newcastle, from 9th November 1850, to Midsummer 1851, at 70*l.* per annum, (being two-thirds of 105*l.* per annum)	£44 0 8		
				Ditto, for receiving the tonnage dues from 9th November 1850, to 31st July 1851, at 50*l.* per annum	36 3 3		
						80 3 11	
				Custom House, for two seats in the long room, from 9th November 1850, to Midsummer 1851, at 26*l.* 13*s.* 4*d.* per annum, (being two-thirds of 40*l.* per annum, the interest of 1,000*l.* at 4 per cent.)		16 15 4	
				John Bell's pension, three-quarters of a year, to Michaelmas 1851, at 50*l.* per annum		37 10 0	
				D. H. Wilson, collector of quay and town dues, poundage on 1,192*l.* 5*s.* 10*d.*, at 7½ per cent.	£89 8 3		
				Commission paid to wharfingers, for collecting, &c.	12 3 11		
						101 12 2	
				F. W. Bell, poundage collecting quay and town dues at Shields		1 0 9	
							2,524 2 3
				By parliamentary and law charges, and surveying account:—			
				J. M. Rendell, Esq., engineer, paid him on account of surveys		500 0 0	
				The Lords of the Admiralty, balance of expenses of Commission of Inquiry		981 9 5	
				Expenses attending surveys, taking borings, making plans, use of steam-boats, &c.		65 4 2	
				W. A. Brooks and Wm. Wakes' expenses to and from London, and tavern expenses, for committee on surveys		32 18 6	
							1,579 12 1
				By interest account:—			
				For one year's interest paid to the Corporation of Newcastle on the principal sum of 67,349*l.*, at 4 per cent.		-	2,615 6 0
				By stock and river craft account:—			
				For machinery in the dredger, and furniture in the engineer's office, paid the Corporation of Newcastle, per agreement		-	1,125 0 0
				By Howdon property:—			
				For three-quarters' of a year's interest on 12,000*l.* mortgage on said property, at 4 per cent., to 2d August 1851, paid to Sir W. A. Maxwell, Bart., (less income tax)		349 10 0	
				Building a wall to enclose Howdon Dock		40 0 0	
				Repairs to the property		44 12 7	
				Commission paid to H. Salkeld, for collecting the rents, on 464*l.* 7*s.* 7*d.*, at 5 per cent.		23 4 5	
				Poor rates, land tax, property tax, &c.		44 2 9	
							501 9 9
				By balance in favour of the Commission		-	2,698 10 11
		£	19,598 3 0			£	19,598 3 0

G. H. Gilchrist, Accountant.

Examined and found correct,

Alex. Geo. Gray,
James Smith,
George Davison,
Robert Eckless,
} Auditors.

Dr. BALANCE SHEET of the River TYNE COMMISSIONERS' ACCOUNT, for the Year ending 9th November 1851. *Cr.*

	£ s. d.		£ s. d.
To the Corporation of Newcastle, for principal sum	67,349 0 0	By the Tyne Improvement Fund account, for principal sum	67,349 0 0
" Sir W. A. Maxwell, Bart., for Howdon property	12,000 0 0	" Howdon property, for purchase account	12,000 0 0
" The Corporation of Newcastle, for river craft	2,450 0 0	" E. K. Fairless, for advance on account of conveying ballast, for next year £120 0 0	
" Sundry tradesmen's accounts unpaid, for materials furnished for dredger and river craft	539 0 11	" William Wake, for advance of office disbursements for next year 50 0 0	
" Tyne Improvement Fund, for balance of revenue account, as per preceding statement £2,698 10 11		" The Corporation of Newcastle, for quay and town dues for the quarter ending 10th October, in course of collection 673 8 0	
" Cash payment to the Corporation, for machinery, &c., transferred to the credit of stock, and to the debit of the Tyne improvement account for revenue 1,125 0 0		" Stock and river craft, for amount 3,575 0 0	
	3,823 10 11		4,418 8 0
		" The Northumberland and Durham District Bank Company, for cash in their hands	2,335 4 4
		" Cash in the hands of the treasurer	58 19 6
	86,161 11 10		86,161 11 10

G. H. GILCHRIST, Accountant.

Newcastle-upon-Tyne, 5th October 1852—Examined and found correct,

ALEX. GEO. GRAY,
JAMES SMITH,
GEORGE DAVISON,
ROBERT ECKLESS,
} Auditors.

Appendix No. 8 *b*.

An ABSTRACT of the TYNE IMPROVEMENT COMMISSIONERS' ACCOUNT, for the Year ending 9th November 1852, comprising Tyne Improvement Fund, Tyne Moorings Fund, and Tyne Piers Fund.

Dr. *Cr.*

	£ s. d.	£ s. d.			£ s. d.	£ s. d.
To ballast dues for depositing and conveying ballast	7,931 10 7		By ballast dues, for conveying ballast, viz. :—	TONS.		
To harbour dues on ship and boat	2,042 1 0		R. W. Swinburne & Co. *South Shields*	16,973 at 11½*d.* per ton	813 5 8	
To dues on commodities brought in as ballast	907 18 1		Thomas Salmon, *South Shields*	13,915		
To town dues on coals, cinders, &c., three-eighths	5,046 1 4		Corporation of Newcastle, *Walker*	5,350		
To ballast office dues on ships	1,964 0 6			19,265 at 10*d.* "	802 14 2	
To groundage and plankage dues	294 5 3		E. K. Fairless, *Jarrow*	15,976		
	18,185 16 9		George Hudson, *South Shields*	7,225		
To quay and town dues £1,502 11 6			Exors. of John Chambers, *ditto*	6,032		
To ditto ditto for the quarter ending 10th October 1852, in course of collection 591 6 5				29,233 at 9*d.* "	1,096 4 9	
	2,093 17 11		Corporation of Newcastle, *Willington*	29,688		
		20,279 14 8	Ditto *Heaton*	6,726		
			Ditto *Walker* (by keels)	4,027		
			Owners of the colliery, *Cramlington*	1,352		
				41,793 at 8*d.* "	1,393 2 0	
			Joseph Mordue, *Wallsend*	9,481 at 6*d.* "	237 0 6	
To ballast warrants		408 12 0		116,745 tons.		4,342 7 1

To dredging machine and river craft :—								By dredging machine and river craft :			
For use of the pile dredger	5	0	0					For amount of expenses dredging in the river, as per engineer's pay bills	3,122	19	0
For use of the weigh keel	23	7	6					For repairs to craft, &c., per ditto	249	11	8
				28	7	6			3,372	10	8
To Howdon property for rents received			-	625	13	6		For goods furnished for the dredger and river craft, outstanding on the 9th November 1852	535	9	7
								By river improvement account, for amount of expenses of river works, at the following places (as per engineer's pay bills,) viz. :—			3,908 0 3
								At Walker	899	15	10
								„ Wallsend	843	3	7
								„ general works	221	2	8
								Engineer's small expenses	33	15	2
								For goods furnished for Walker and general works, outstanding on the 9th November 1852	1,997	17	3
									88	6	2
											2,086 3 5
								By dues on coals, cinders, &c. :—			
								For commission collecting dues on coals, paid to the Corporation of the Trinity House, London	-	-	35 7 6
								By quay and town dues :—			
								For amount paid to the Benevolent Fund, &c., for particulars of cargoes imported	-	-	69 8 6
								By port and harbour charges :—			
								For harbour master's disbursements at *Newcastle*, for labourage, cleaning drains, and small expenses	171	0	3
								For harbour master's disbursements at *Shields*, for repairs, office rents, and various other expenses	103	5	0
								For income-tax on port and harbour charges	452	14	0
								For one-third of the expense of maintaining the river police, to 9th November 1852	810	14	6
								For engraving, stationery, and printing	57	16	2
								For D. H. Wilson and Robert Pinkney's expenses	7	5	2
								For W. G. Morrison's proportion of charge for arbitration as to the value of the river stock	11	5	0
								For printing, repairing boats, and small expenses	10	3	6
											1,624 3 7
								By salaries, viz:—			
								W. A Brooks, engineer, one year's salary to Michaelmas, 1852	350	0	0
								Robert Pinkney, ballast office clerk, ditto to ditto	200	0	0
								Simon Danson quay and harbour master, Newcastle ditto to ditto	175	0	0
								Jacob Danson, ballast inspector, ditto to ditto	150	0	0
								William Wake, harbour master, North Shields ditto to ditto	150	0	0
								Lancelot Elliot, harbour master, South Shields ditto to ditto	100	0	0
								Lawson Dunn, ballast assessor, South Shields ditto to ditto	100	0	0
								Joseph Salkeld, ballast master, Willington ditto to ditto	65	0	0
								Robert Pinkney's two assistants, ballast office ditto to ditto	80	0	0
Forward	-	-	£	21,342	7	8		Forward £	1,370	0	0 7,723 3 3

Cr. Abstract of the Tyne Improvement Commissioners Account, for the Year ending 9th November 1852—*continued.* *Dr.*

	£	s.	d.
To amount brought forward	21,342	7	2
To balance against the Commission	846	16	2

	£	s.	d.	£	s.	d.
By amount brought forward				7,723	3	3
By salarics, &c —*continued*	1,370	0	0			
Robert Forster, assistant to harbour master, Newcastle, one year's salary to Michaelmas 1852	60	0	0			
Geo. Clark, assistant collector of quay and town dues, ditto to ditto	50	0	0			
Ann Dixon, ballast office messenger, ditto to ditto	30	0	0			
Jno. Bell's pension, ditto to ditto	50	0	0			
F. B. Bell, collector of port dues at Shields, ditto to ditto	46	13	4			
Ballast inspector's two boatmen, 51 weeks, to 30th October 1852, at 20*s.* each per week	102	0	0			
William Wake, harbour master, North Shields, for wages to his clerk and eight boatmen, from 1st November 1851 to 11th November 1852, 54 weeks, viz., three men at 22*s.* and six men at 20*s.* each per week	502	4	0			
For wages to messengers, with ballast warrants, 2,043 warrants at 2*s.* each from 1st November 1851, to 31st October 1852	204	6	0			
Custom House, Newcastle, for accommodation of two seats in the long room for one year, due at Michaelmas, 1852	26	13	4			
William Williams, collector of customs, Newcastle, one year's salary for collecting tonnage dues, due to 31st July 1852	50	0	0			
Ditto, ditto one year's salary for collecting port dues to same time	70	0	0			
Collector of customs at Shields, commission for collecting tonnage dues 174*l.* 2*s.* 11*d.* at 5 per cent	8	14	2			
D. H. Wilson, collector of quay and town dues, Newcastle, poundage on 1,992*l.* 16*s.* 4*d.* at 7½ per cent.	144	7	0			
Wharfingers paid them for collecting foreign dues	24	0	1			
F. B. Bell, commission for collecting quay and town dues at Shields, 145*l.* 7*s.* 8*d.* at per cent.	7	5	4			
G. H. Gilchrist, for his services as accountant	90	10	0			
John Clayton, clerk to the Commissioners, for one year and a quarter's salary to Michaelmas, 1852	175	0	0			
William Armstrong, treasurer, one year's salary to Michaelmas 1852	100	0	0			
				3,111	13	3
By parliamentary and law charges and surveying account:—						
For expenses of borings, soundings, surveys, &c., per the engineer's pay bills	499	11	2			
M. & M. W. Lambert, engraver's account for river plans, &c.	313	8	0			
W. A. Brooks, engineer, on account of his services	200	0	0			
Lords of the Admiralty on account of the expenses of the preliminary inquiry	100	0	0			
Expenses of witnesses to and from London	244	10	0			
J. M. Rendell, engineer, on account of surveys	500	0	0			
Mr. Talbot's fees	144	18	0			
Dyson & Co., Parliamentary agents, for the expenses in passing the Tyne Improvement Bill, 1852	1,274	5	7			
Ditto, for the expenses in regard of the North Shields Quays and Improvement Bill, 1851	37	5	4			
Youngs and Crighton, law stationers, for 300 copies of the Tyne Improvement Bill	98	9	6			
Tavern expenses on surveys	17	19	9			
				3,430	7	4

Dr. An Abstract of the Accounts of the River Tyne Moorings Fund from the 17th June to 9th November 1852. *Cr.*

RIVER POLICE ACCOUNT.

	£	s.	d.		£	s.	d.
To one-third of tonnage dues on shipping at ¼*d.* per ton	432	11	3	By balance on 17th June	926	2	5
To Tyne Improvement Fund, for one-third of the expense of maintaining the river police, from 1st January to 9th November, 1852	393	4	4	By policemen's wages	426	10	6
To balance forward	685	10	4	By clothing and appointments	51	17	6
				By fitting up and furniture for stations	19	2	7
				By boats, &c.	23	0	10
				By printing, advertising, &c.	1	2	3
				By rents, taxes, and gas for stations	42	19	10
				By coals for stations	3	10	4
				By miscellaneous disbursements	16	13	8
£	1,511	5	11	£	1,511	5	11

MOORINGS ACCOUNT.

	£	s.	d.		£	s.	d.
To balance on 17th June	1,347	1	6	By Messrs. Pow and Fawcus, accounts outstanding, 17th June	109	16	1
To two-thirds tonnage dues on shipping at ¼*d.* per ton	865	2	4	By old moorings account:—			
To mortgages—Margaret Georgiana Alice Rankin, advanced on interest at 4 per cent.	500	0	0	Labourage £248 15 5			
To balance forward	623	17	3	Repairs to vessels 8 5 0			
				Materials 1 15 9			
					258	16	2
				By new moorings account:—			
				Labourage— 238 6 4			
				Materials.—Messrs. Toward & Son for iron buoys, &c. £150 0 0			
				Messrs. Pow & Fawcus, Messrs. Abbot & Co., Messrs. Toward, and Messrs. Rayne & Burn for accounts outstanding for iron buoys, chains, &c. 2,217 9 10			
				2,367 9 10			
					2,605	16	2
				By interest:—			
				William Mather, half-year's interest on 5,000*l.* due 13th June, less 3*l.* 13*s.* income tax 121 7 0			
				John Abbot, half-year's interest on 11,000*l.* due 13th October, less 6*l.* 8*s.* 4*d.* income tax 213 11 8			
				Messrs. Trotter & Elder, half-year's interest on 1,100*l.*, due 7th August, less 16*s.* income tax 26 14 0			
					361	12	8
£	3,336	1	1	£	3,336	1	1

James Guthrie, Accountant.

Newcastle-upon-Tyne, April 26, 1853.—Examined and found correct,

Thomas Gray,
Geo. Davison,
Robt. Eckless,
James Smith,
} Auditors.

W. R. Hunter, Chairman.

Dr. BALANCE SHEET of the River TYNE MOORINGS FUND, 9th November 1852. *Cr.*

	£	s.	d.	£	s.	d.		£	s.	d.
To sundries for principal sums, viz.:—William Mather, Esq.	5,000	0	0				By moorings account, for principal sums	17,600	0	0
Thomas Elder	600	0	0				By moorings account for revenue	623	17	3
Alexander Trotter	500	0	0				By river police account	685	10	4
John Abbot	11,000	0	0				By Northumberland and Durham District Banking Company	755	10	4
Margaret Georgiana Alice Rankin	500	0	0				By cash in hands of treasurer	262	8	11
				17,600	0	0				
To sundries for outstanding accounts, viz.:—Messrs. Pow & Fawcus	1,226	19	8							
Messrs. John Abbot & Co.	926	12	3							
Messrs. Toward & Son	52	7	6							
Messrs. Rayne & Burn	121	6	6							
				2,327	5	11				
			£	19,927	5	11	£	19,927	5	11

JAMES GUTHRIE, Accountant.

W. R. HUNTER, Chairman.

Newcastle-upon-Tyne, April 26, 1853.—Examined and found correct,

THOMAS GRAY,
GEO. DAVISON,
ROBT. EKLESS,
JAMES SMITH,
} Auditors.

3 M

Dr. STATEMENT of ACCOUNT of the River TYNE PIERS FUND, from 23rd June to 9th November 1852. *Cr.*

	£.	s.	d.	£	s.	d.		£	s.	d.
To pier dues :—On foreign ships	857	15	0				By Northumberland and Durham District Banking Company	4,888	15	10
On coasting ditto	4,047	2	3				By cash in treasurer's hands	16	1	5
				4,904	17	3				
			£	4,904	17	3	£	4,904	17	3

JAMES GUTHRIE, Accountant.

W. R. HUNTER, Chairman.

Newcastle-upon-Tyne, April 26, 1853.—Examined and found correct,

THOMAS GRAY,
GEO. DAVISON,
ROBT. EKLESS,
JAMES SMITH,
} Auditors.

Appendix No. 8 c.

Appendix No. 8 c.

An ABSTRACT of the TYNE IMPROVEMENT COMMISSIONERS' ACCOUNT for the Year ending 9th November 1853, comprising Tyne Improvement Fund, River Moorings Fund, Piers Fund, Northumberland Dock Fund.

REPORT of the FINANCE COMMITTEE.

THE annual accounts for the year ending 9th November 1853, show, under the Tyne Improvement Fund, an ordinary revenue of 22,063*l.* 6*s.* 6*d.*, being an increase of 1,275*l.* upon the previous year. As this sum does not comprise a quarter's receipts in respect of quay and town dues, the actual surplus of the year may be estimated at 1,800*l.* The cause of omitting a quarter's receipts of these dues arises from the accounts of the 5th of July to the 5th of October not having been completed; and as they are not likely to be ready on future occasions, it has been thought expedient to adopt as a rule, that the receipts from this source shall henceforth show the income from the 5th July of the past to the 5th July of the running year.

The whole of the expenses connected with the passing of the Tyne Improvement Act, 1852, having to be paid by the dock, piers, and mooring funds, the several sums advanced by the Tyne Improvement Fund have now been placed against these departments; which accounts for the sum of 4,448*l.* 1*s.* 9*d.* appearing as a receipt by the Tyne Improvement Fund.

The mortgages contracted under the borrowing powers of the Tyne Improvement Act 1850, amount to 16,000*l.*

The total income for the past year has been as follows, viz.:—

	£	s.	d.
Ordinary revenue	22,063	6	6
Parliamentary and law charges, repaid as above	4,448	1	9
Mortgages contracted	16,000	0	0
Received for the use of dredger and weigh keel	241	12	11
Rents of Howdon property	267	15	3
	£43,020	16	5

And the outgoings have been as follows, viz:—

	£	s.	d.
Ballast conveying	5,052	4	11
Dredging and river craft	4,641	15	10
River improvements	2,251	19	11
Small expenses of collecting dues	64	5	0
Port and harbour charges	1,152	13	0
Salaries	3,280	6	1
Interest	2,857	19	10
Expenses of Howdon property	638	12	7
Parliamentary and law charges	16,111	1	0
Mortgages paid off	4,000	0	0
	£40,050	18	2

Which leaves a balance of 2,969*l.* 18*s.* 3*d.* in favour of the Commission.

The expenditure for ballast conveying has been 5,052*l.* 4*s.* 11*d.*, being 709*l.* 17*s.* 10*d.* more than last year. The quantity of ballast conveyed is 135,462 tons, against 116,745 tons in 1852.

The expense of dredging has been 4,055*l.* 2*s.* 10*d.* against 3,908*l.* 0*s.* 3*d.* last year. The cost of considerable repairs to weigh keel, amounting to 586*l.* 13*s.* 0*d.*, makes up the total expenditure for dredger and river craft, viz., 4,641*l.* 15*s.* 10*d.*

The river improvement account shows an expenditure of 2,251*l.* 19*s.* 11*d.*, against 2,086*l.* 3*s.* 5*d.* last year, viz.:—

	£	s.	d.
River wall, &c., at Walker	317	18	6
River wall, &c. at Hebburn	648	2	10
Jetties at Hebburn	459	13	9
River walls and dolphins at Wallsend	435	12	6
General works	347	11	4
Engineer's small expenses	43	1	0
	£2,251	19	11

The accounts of the Howdon property show a loss of 370*l.* 17*s.* 4*d.*, a state of things which will continue so long as the property is allowed to remain in its present miserably dilapidated condition. Though only half a year's rental appears in the accounts, they will not be improved by the result of the next half year's collection, as the cost of repairs will consume the whole.

Under the head of parliamentary and law charges, &c., the expenditure has been 16,111*l.* 1*s.*, viz. :—

	£	s.	d.
Expenses connected with Tyne Improvement Act, 1852	1,597	7	3
" " North Shields Quay Bill, 1851	111	3	8
General business	73	18	5
Opposition to Tynemouth Dock Bill	1,826	7	2
Soundings in the river, and miscellaneous	198	12	0
Parliamentary, law, and engineering accounts, connected with Tyne Improvement and Conservancy Bills of 1850	12,303	12	6
	£16,111	1	0

An additional mortgage debt of 16,000*l.* has been contracted; but 4,000*l.*, part of the original debt of 67,349*l.* has been paid off. The whole debt has thus been increased by 12,000*l.*, making a total debt 79,349*l.*

The available balance in the bank to the credit of the fund is at present 2,831*l.* 5*s.*

Assuming the income of the Commission during the current year to be the same as during the year just terminated, it appears that, after payment of the fixed charges of ballast conveying, salaries, interest, and port and harbour charges, there will remain applicable to the purposes of dredging, river works, and to meet the other requirements of the Commission, the sum of 10,000*l.*, or thereabouts.

The unpaid law and engineering accounts amount to £7,120 16*s.* 6*d.*, as under :—

Balance due to promoters of Tyne Conservancy Bill, 1850	£1,407	19	8
Balance due to promoters of Tyne Improvement Act, 1850, for costs of said Act, and for opposition to Conservancy Bill	4,616	4	5
Balance due to Mr. Rendel, for surveys, &c.	1,096	12	5
	£7,120	16	6

If it should be decided to discharge this sum, together with the cost of the proposed new dredger, by contracting additional mortgages, it will absorb 16,000*l.* of the 18,000*l.* yet procurable under the borrowing powers of the Tyne Improvement Act, 1850, originally amounting to 30,000*l.*

Mooring and Police Accounts.

The income from the farthing tonnage duty shows a slight decrease of 123*l.* 3*s.* 7*d.*

The income for the moorings has been as follows :—

Two-thirds tonnage dues	£1,836	11	4
Receipts in respect of mortgages	9,500	0	0
	£11,336	11	4
Expenditure.			
Stores and repairs to mooring vessels	£129	12	11
Repairs to old moorings at North Shields	661	9	8
Laying down new moorings at South Shields	8,538	18	6
New dolphins at North and South Shields, and miscellaneous	221	6	5
Interest	777	7	8
Tyne Improvement Fund, for one-fifth of cost of Act of 1852	872	12	5
Law bills for procuring mortgages	50	15	3
	£11,252	2	10
To which add last year's balance	623	17	3
Total	£11,876	0	1

Which shows that the fund is now in debt, on revenue account, to the extent of 539*l.* 8*s.* 9*d.*

The total mortgage debt now secured on this fund amounts to 27,100*l.*

The state of this account requires the most serious attention of the Commissioners. The annual income on an average of three years is 1,846*l.*, while the interest charge is now 1,084*l.*, leaving only 762*l.* applicable towards repairs and towards laying down new moorings. The repairs of the old moorings alone have cost this year 661*l.* 9*s.* 8*d.* The

Appendix No. 8 *c.*

number to be kept in repair for the future is of course much larger. It thus appears that whatever additional moorings are to be laid down at the expense of this fund, beyond what can be done with the materials now on hand, can only be done by contracting fresh mortgages; and it is to be feared that were more mortgage debt incurred, the expenditure would be made permanently to surpass the income, and so cause the Tyne improvement fund to be made chargeable with an annual burthen.

The police accounts show an increased expenditure of 329*l.* 8*s.* 4*d.*: and estimating the future expenses at 1,600*l.*, it will require a yearly contribution from the Tyne improvement fund to the extent of about 700*l.*, in aid of the one-third of the farthing tonnage due.

Tyne Piers Fund.

These accounts show that 10,423*l.* 10*s.* 5*d.* have been received as dues, and 226*l.* 16*s.* 2*d.* as interest from the District Bank. The payments amount to 1,808*l.* 9*s.* 4*d.*, leaving an available balance of 8,841*l.* 17*s.* 3*d.* to be carried this year to the credit of the fund—which, added to 4,904*l.* 17*s.* 3*d.*, the balance of last year, shows 13,746*l.* 14*s.* 6*d.* as the total sum now to the credit.

Complaints having been made by the auditors, that the Commissioners possessed no record showing the details of receipts in respect of the pier and river watch dues, an arrangement has been made, with the assistance of the collector of customs, which it is hoped will be satisfactory. The collector will henceforth retain duplicates of every receipt given for dues, and the accountant to whom the duplicates are to be delivered will register every ship's name and tonnage, and notify all exemptions, so that the amount appearing in his book will agree with the payments made into the Bank by the collector.

Northumberland Dock Fund.

The sum of 13,600*l.* has been borrowed for the benefit of this fund, and the receipt of interest amounts to 55*l.* 15*s.*

The payments consist of 1,906*l.* 5*s.* 8*d.* for parliamentary and law charges, 1,000*l.* for preparation of working plans, and 4,000*l.* paid on account to the contractor, leaving a disposable balance of 6,749*l.* 9*s.* 4*d.*

The clerk has securities ready to take upon this fund as the money is required.

Christian Allhusen.
Thomas Ridley.
James C. Stevenson.
John Ormston.

8th December 1853.

Dr. AN ABSTRACT of the TYNE IMPROVEMENT ACCOUNT FUND for the Year ending the 9th November 1853. *Cr.*

	£ s. d.	£ s. d.
To ballast dues for depositing and conveying ballast	9,832 13 4	
To harbour dues on ship and boat	2,024 15 9	
To dues on commodities brought in as ballast	919 19 9	
To town dues on coals, cinders, and grindstones, three-eighths	5,261 1 0	
To ballast office dues on ships	1,873 7 0	
To groundage and plankage dues	283 6 3	
To ballast warrants	558 9 5	
To quay and town dues, three-quarters of a year	1,309 14 0	
		22,063 6 6
To dredging machine and river craft :—		
For use of dredger	170 5 10	
For use of weigh keel	71 7 1	
		241 12 11
To Howdon property, for rents received, one half-year	- -	267 15 3
To parliamentary and law charges, for expenses repaid :—		
Northumberland Dock Fund, for two-fifths of expenses of obtaining Tyne Improvement Act, 1852, and for dock expenses	1,805 4 8	
Tyne Piers Fund, for two-fifths of expenses of obtaining Tyne Improvement Act, 1852, and for pier expenses	1,770 4 8	
	3,575 9 4	
River moorings fund, for one-fifth of expenses of obtaining Tyne Improvement Act, 1852, outstanding 9th November 1853	872 12 5	
		4,448 1 9
To mortgages contracted :—		
For principal sums advanced on mortgage securities, all bearing interest at 4 per cent. per annum	- -	16,000 0 0
Forward	- -	43,020 16 5

	Tons.	£ s. d.	£ s. d.
By ballast dues, for conveying ballast			
R. W. Swinburne & Co., *South Shields*	22,206 at 11½*d.* per ton	1,064 0 8	
Thomas Salmon, *South Shields*	13,502		
Corporation of Newcastle, *Walker*	4,945		
	18,447 at 10*d.* per ton	768 12 6	
Chambers's executors, *South Shields*	7,161		
Matthew Stainton, *South Shields*	10,989		
E. K. Fairless, *Jarrow*	16,947		
	35,097 at 9*d.* per ton	1,316 2 9	
Owners of Colliery, *Cramlington*	577		
Corporation of Newcastle, *Walker* (keels)	2,566		
Corporation of Newcastle, *Willington*	36,770		
Corporation of Newcastle, *Heaton*	9,365		
	49,278 at 8*d.* per ton	1,642 12 0	
Joseph Mordue, *Wallsend*	10,434 at 6*d.* per ton	260 17 0	
Total	135,462		5,052 4 11
By dredging machine and river craft :			
For expenses of dredging—90,934 tons raised.			
Dredger and craft—			
Wages to crew of dredging vessel		451 7 0	
Wages to keelmen and keel hire		920 5 6	
Delivering and towing dredged materials		1,577 3 9	
Rent of storehouse, one year and a quarter		20 0 0	
Smiths' bills for repairs		82 0 9	
Stores for dredger		42 3 10	
Timber for dredger		51 1 7	
		4,144 2 5	
Paid for plans of new dredger		30 0 0	
Sundries for repairs to craft		306 4 11	
		3,480 7 4	
For goods furnished, and repairs to dredger and river craft outstanding on the 9th November 1853		574 15 6	
		4,055 2 10	
Weigh Keel :			
Sims & Co., ropes for weigh keel	£9 19 2		
Tyzack & Co., goods for ditto	9 6 4		
	19 5 6		
Accounts outstanding for repairs	567 7 6		
		586 13 0	
			4,641 15 10
Forward		- - £	9,694 0 9

Dr. Abstract of the Tyne Improvement Account Fund for the Year ending the 9th November 1853—*continued.* *Cr.*

	£	s.	d.		£	s.	d.	£	s.	d.
To amount brought forward	43,020	16	5	By amount brought forward				9,694	0	9
				By river improvement account, for expenses of works at following places, as under						
				Walker—						
				Labourers and masons, forming river wall	£53	16	0			
				James Gibson, superintendent, 10 weeks	20	0	0			
				Steamboat towing materials	12	0	0			
				Sundries for Delg chalk for river wall	196	4	6			
				Ditto for lime and cement	33	4	4			
				R. H. Haggie, account outstanding, 9th November 1852	2	13	8			
								317	18	6
				Hebburn—						
				Carpenters driving beacon piles, and labourers and keelmen forming river wall	273	17	10			
				James Gibson, superintendent, 42 weeks	84	0	0			
				Keelmen for chalk and stone	233	17	0			
				Steamboats for towing	56	8	0			
				Maybank & Nursay, contractors, for labourage at Hebburn jetties	63	19	1			
				Smith work at jetties	33	14	1			
				Timber for jetties	362	0	7			
								1,107	16	7
				Wallsend—						
				Carr & Co., account outstanding, 9th November 1852	11	14	11			
				Sundries for chalk for river wall	224	18	9			
				Labourers and keelmen forming ditto	23	6	0			
				Smiths' bill for repairs	10	10	11			
				Carpenters driving dolphin piles, &c.	23	18	9			
				Timber for dolphins	151	3	2			
								435	12	6
				General Works—						
				Labourers setting-back river wall at Jarrow Bight	6	10	8			
				Taking borings at Hayhole	7	18	0			
				Diver and watermen removing wrecks off the Bar, and in Shields harbour	128	1	4			
				Steamboat at ditto, and for use of chains	4	15	0			
				Labourers removing canch at St. Anthony's Reach	18	2	6			
				James Turner, for lias lime	24	18	0			
				Labourers and keelmen removing canch and closing North Channel at Stella	54	1	8			
				Sundry small works	17	12	8			
					£261	19	10			
				James Turner, account outstanding, for 3 cargoes of lias lime	85	11	6			
								347	11	4
				Engineers' small expenses				42	1	0
										2,251	19	11

By dues on coals and cinders, &c.:—									
For commission collecting dues on coals, paid to the corporation of the Trinity House, London	-	-	-	-	-	-	-	43	16 0
By quay and town dues:—									
For amount paid to the Benevolent Fund for particulars of cargoes	-	-	-	-	-	-	-	20	9 0
By port and harbour charges :—									
For harbour master's disbursements at Newcastle for labourage, cleaning drains, and small expenses	-	-	-	-	-	-	183	9	8
For harbour master's disbursements at Shields for repairs, office rents, and various other expenses	-	-	-	-	-	-	112	14	5
Jacob Danson, coals for his office	-	-	-	-	-	-	2	2	0
Printing and stationery	-	-	-	-	-	-	131	7	10
Collector of quay and town's dues expenses	-	-	-	-	-	-	2	11	0
R. Pinkney's small disbursements	-	-	-	-	-	-	2	17	0
Incidentals for accountant's office	-	-	-	-	-	-	16	13	10
Corporation of Newcastle, one and a half year's rent of ballast assessor's house at Walker	-	-	-	-	-	-	24	0	0
Railway Company for carriage	-	-	-	-	-	-	0	18	4
Expenses of river police, being amount of the expenses of police in excess of the amount of tonnage dues applicable to police purposes	-	-	-	-	-	-	650	15	8
							1,127	9	9
							25	3	3
							1,152	13	0
Account outstanding, R. Robinson for stationery,	-	-	-	-	-	-			
By salaries :—									
W. A. Brooks, engineer, one year's salary to Michaelmas 1853	-	-	-	-	-	-	500	0	0
Robert Pinkney, ballast office clerk, ditto to ditto	-	-	-	-	-	-	200	0	0
Simon Danson, quay and harbour master, ditto	-	-	-	-	-	-	175	0	0
Jacob Danson, ballast inspector, ditto	-	-	-	-	-	-	150	0	0
W. Wake, harbour master, North Shields, ditto	-	-	-	-	-	-	150	0	0
James Guthrie, accountant, half-year's salary to 17th August 1853	-	-	-	-	-	-	60	0	0
L. Elliott, deputy harbour master, South Shields, one year to Michaelmas 1853	-	-	-	-	-	-	100	0	0
Lawson Dunn, half-year's salary to Lady-day	-	-	-	-	-	-	50	0	0
Lawson Dunn's representatives, quarter's pension to Midsummer	-	-	-	-	-	-	16	13	4
R. Pinkney's two assistants, one year's salary to Michaelmas 1853	-	-	-	-	-	-	80	0	0
R. Forster, assistant harbour master, ditto to ditto	-	-	-	-	-	-	60	0	0
G. Clark, assistant collector of quay and town dues, ditto to ditto	-	-	-	-	-	-	50	0	0
Joseph Salkeld, ballast assessor, Willington, ditto to ditto	-	-	-	-	-	-	65	0	0
Ann Dixon, ballast messenger, ditto to ditto	-	-	-	-	-	-	30	0	0
John Bell's pension, ditto to ditto	-	-	-	-	-	-	50	0	0
F. B. Bell, collector of port dues at Shields, ditto to ditto	-	-	-	-	-	-	46	13	4
J. B. Bruce, ballast inspector, half-year to 14th September 1853	-	-	-	-	-	-	35	0	0
Ballast inspector's two boatmen for wages, 54 weeks, to 12th November 1853	-	-	-	-	-	-	108	0	0
W. Wake, harbour master, North Shields, for wages to his clerk and nine boatmen to 12th November 1853	-	-	-	-	-	-	522	12	0
For wages to messengers with ballast warrants, 2,030 warrants at 2s.	-	-	-	-	-	-	203	0	0
Forward	-	-	-	-	-	£	2,651	18	8
							13,162	18	8
Forward	-	-	-	-	-	£	43,020	16	5

Abstract of the Tyne Improvement Account Fund for the year ending the 9th November 1853—*continued.*

Dr.

	£	s.	d.
To amount brought forward	43,020	16	5

Cr.

	£	s.	d.	£	s.	d.
By amount brought forward	2,651	18	8	13,162	18	8
By salaries—*continued.*						
W. J. Williams, collector of customs, Newcastle, one year's salary for collecting port dues to 31st July 1853	70	0	0			
Ditto ditto one year's salary for collecting tonnage dues to same time	50	0	0			
Custom House, Newcastle, for accommodation of two seats in the long room, one year to Michaelmas 1853	26	13	4			
W. Armstrong, treasurer, one year's salary to ditto	100	0	0			
John Clayton, clerk, ditto to ditto	140	0	0			
Collector of quay and town dues, Newcastle, commission of 7½ per cent.	142	11	4			
Wharfingers, for collecting foreign dues	27	0	9			
G. H. Gilchrist, for making up books to 9th November 1852	50	0	0			
F. B. Bell, commission on quay and town dues collected at Shields	6	6	11			
Collector of customs, South Shields, commission of 2½ per cent on tonnage dues	0	19	3			
Ditto, North Shields, ditto on ditto	8	15	10			
Joseph Wake, for his services as porter	5	0	0			
R. Forster, for looking after planks	1	0	0			
				3,280	6	1
By interest account :—						
Corporation of Newcastle, for interest on mortgage paid off to 12th March, 1853 (executors of James Archbold)	25	17	10			
Ditto for ditto to 12th March, 1853 (Rev. A Reid)	12	19	0			
Ditto for ditto to 22d April, 1853 (executors of Jane Archbold)	4	13	8			
Income tax on debt, one year	78	15	0			
Corporation of Newcastle, interest on £63,349 to 9th November, 1853	2,472	18	7			
Half-year's interest on £3,000 to 10th September, 1853	58	5	0			
Interest on £1,000 due 10th September, 1853	15	1	10			
Half-year's interest on £5,000, due ditto	97	1	8			
Ditto on £1,000, due ditto	19	8	4			
Ditto on £,2000, due ditto	38	16	8			
Ditto on £1,000, due ditto	19	8	4			
Northumberland and Durham District Banking Company, interest on account to 9th November, 1853	14	13	11			
				2,857	19	10
By Howdon property :—						
Sir W. A. Maxwell, Baronet, one year's interest on £12,000 mortgage to 2d August, 1853	466	0	0			
One year's property tax	8	15	0			
General repairs to property, per H. Salkeld	118	6	7			
H. Salkeld, commission at 5 per cent. on £2,617 4*s.* 3*d.*	13	7	9			
Dean and chapter, for rents, land tax, &c.	6	1	9			
One year's fee farm rent	2	16	4			
Corporation of Newcastle, one and a half year's rent on messuages and ground	16	19	0			
Sun Fire Office, half-year's insurance	6	6	2			
				638	12	7

By parliamentary and law charges and surveying account :—							
Expenses of soundings, per the engineer's pay bills, &c.					97	10	8
Expenses *re* piers and docks repaid					65	0	0
Expenses on river views					36	1	4
J. & M. Clayton, law bill, general business (for three years)					53	18	5
North Shields Quay Bill—							
J. & M. Clayton, their law bill for opposition to					111	3	8
Tyne Improvement Act, 1852 :—							
Board of Admiralty, balance of expenses attending Mr. Walker's inquiry	£317	11	10				
Counsel's fees	295	1	0				
J. & M. Clayton, their bill for obtaining Act	715	6	11				
J. & M. Clayton, for sundry payments by them	147	11	2				
Account outstanding 9th November, 1853	121	16	4				
				1,597	7	3	
Tynemouth Dock Bill, 1852, *Opposition to*—							
W. E. and C. H. Brooks, preparing plans	£41	12	6				
Expenses of witnesses at Admiralty Inquiry at North Shields	17	0	8				
W. A. Brook's travelling expenses	25	0	0				
J. & M. Clayton, for witnesses, counsels' fees, and other expenses	1,285	18	1				
J. & M. Clayton, their law charges for opposition to bill	456	15	11				
				1,826	7	2	
Tyne Improvement and Conservancy Bills, 1850—							
Lietch & Kewney, on account of costs payable to promoters of Tyne Conservancy Bill	£5,500	0	0				
Claytons & Dunn, on account of costs payable to promoters of Tyne Improvement Bill, and for opposition to Tyne Conservancy Bill	5,500	0	0				
Mr. Rendel, on further account of his bill *re* Tyne Improvement and Conservancy Bills, and for river surveys	1,000	0	0				
T. & J. Salmon, South Shields, being amount of their taxed costs in Tyne Improvement and Conservancy Bills, 1850	253	12	6				
W. A. Brooks, on account of his charges for assisting and maintaining Tyne Improvement Act, 1850	50	0	0				
				12,303	12	6	
							15,111 1 0
By Mortgages paid off—							
Corporation of Newcastle for principal sums paid off, being part of £67,349				-	-		4,000 0 0
							40,050 18 2
By balance in favour of the Commission				-	-		2,969 18 3
						£	43,020 16 5

£ 43,020 16 5

JAMES GUTHRIE, Accountant.

JOSEPH COWEN, Chairman.

Newcastle-upon-Tyne, January 10th, 1854.—Examined and found correct.

THOMAS HEDLEY,
GEORGE DANISON,
ROBERT ECKLESS,
JAMES SMITH,
} Auditors.

Balance Sheet of the River Tyne Improvement Fund, for the Year ending 9th November 1853.

Dr. *Cr.*

	£	s.	d.		£	s.	d.
To sundries for principal sums :—				By the Tyne Improvement Fund, for principal sums	79,349	0	0
Corporation of Newcastle - £63,349 0 0				By Howdon property, for purchase account	12,000	0	0
Various other mortgages - 16,000 0 0				By stock and river craft	3,651	6	0
	79,349	0	0	By Northumberland and Durham District Banking Company, for balance in bank	2,831	5	0
To Sir W. A. Maxwell, Bart., for Howdon property	12,000	0	0	By river moorings fund	872	12	5
To sundry tradesmen's accounts outstanding	1,395	15	4				
To Tyne Improvement Fund, for balance of revenue on the 9th November, 1852, £2,976 14 9							
Balance for year ending 9th November, 1853 - 2,969 18 3							
	5,946	13	0				
To cash owing to treasurer	12	15	1				
£	98,704	3	5	£	98,704	3	5

James Guthrie, Accountant.

Joseph Cohen, Chairman.

Newcastle-upon-Tyne, 10th January, 1854.—Examined and found correct,

Thomas Hedley,
George Davison,
Robert Eckless,
James Smith.
} Auditors.

River Police Account.

	Tons.	£	s.	d.		£	s.	d.
To tonnage due of one farthing upon shipping:—					By balance brought from last year	685	10	4
At Custom House, Newcastle, on - £2,371,792 - £2,470 12 4					By policemen's wages	1,187	16	10
At Custom House, North Shields, on - 161,600 - 168 6 8					By fittings-up and furniture for stations	44	3	2
At Custom House, South Shields, on - 111,265 - 115 18 1					By boats, &c.	85	3	1
2,644,657		2,784	17	1	By clothing and appointments	71	14	6
Deduct two-thirds carried to moorings account		1,836	11	4	By printing, advertising, and stationery	14	2	10
		918	5	9	By rents, taxes, and gas	134	8	4
To Tyne Improvement Fund, for expenses of police in excess of tonnage dues applicable to police purposes		650	15	8	By coals for stations	21	8	0
To balance against fund forward		685	10	4	By medicine and attendance	0	8	4
					By miscellaneous disbursements	39	16	4
	£	2,254	11	9	£	3,254	11	9

Dr. MOORINGS ACCOUNT. *Cr.*

	£	s.	d.					£	s.	d.
To two-thirds of tonnage dues as above	1,836	11	4	By balance from last year				623	17	3
To mortgages contracted (bearing interest at 4 per cent.), viz.:—				By stores for mooring vessels				97	13	5
One for £2,500 0 0				By repairs to mooring vessels				31	19	6
Another for 7,000 0 0				By old moorings account :—						
	9,500	0	0	Labourage and expenses in overhauling, repairing, and maintaining old moorings at North Shields, as per engineer's pay bills, &c.				661	9	8
				By new moorings account:—						
				Labourage in laying down new moorings at South Shields			822 1 0			
				Materials for ditto						
				Toward and Son, for buoys	946	18	0			
				Rayne and Burn, for ditto	849	5	6			
				Tyzack and Co., for screws	510	7	0			
				John Abbot and Co., for buoys and ground chains	2,962	1	0			
				Pow and Fawcus, for ground chains, &c.	1,381	13	6			
				Knott and Sons, for ropes	37	0	1			
				Miscellaneous	4	3	7			
					£6,691	8	8			
				Outstanding accounts, 9th November 1853	1,025	8	10			
							7,716 17 6			
				Labourage at new dolphins	34	6	0			
				Timber and smith work for ditto	181	18	11			
							216 4 11			
				Miscellaneous			5 1 6			
								8,760	4	11
				By interest account:—						
				Half year's interest on mortgage for 5,000*l.*, due 25th December 1852			121 7 0			
				Interest on 5,000*l.* to 28th April			107 11 2			
				One year's interest on mortgage for 1,100*l.*, due 7th August			53 7 0			
				One year's interest on mortgage for 11,000*l.* due 13th October			427 3 4			
				One-year's interest on 500*l.* to 23d October			19 8 4			
				Half-year's interest on 2,500*l.*, due 25th May			48 10 10			
								777	7	8
				By Parliamentary and law charges account:—						
				J. & M. Clayton, law bill for mortgage			50 15 3			
				Tyne Improvement Fund, one fifth of expenses connected with obtaining Tyne Improvement Act, 1852.			872 12 5			
								923	7	8
To balance forward	539	8	9							
£	11,876	0	1				£	11,876	0	1

JAMES GUTHRIE, Accountant.

JOSEPH COWEN, Chairman.

Newcastle-upon-Tyne, 10th January 1854.—Examined and found correct,

THOMAS HEDLEY,
GEORGE DAVISON,
ROBERT ECKLESS,
JAMES SMITH,
} Auditors.

BALANCE SHEET of the River TYNE MOORINGS FUND, for the Year ending 9th November 1853

Dr. *Cr.*

	£	s.	d.		£	s.	d.
To sundries, for different sums due to different mortgagees	27,100	0	0	By moorings account for principal sums	27,100	0	0
To sundry tradesmen's accounts outstanding	1,029	18	10	By moorings account, for revenue	539	8	9
To Tyne improvement fund	872	12	5	By river police account	685	10	4
				By Northumberland and Durham District Banking Company	448	9	4
				By cash in hands of treasurer	229	2	10
£	29,002	11	3	£	29,002	11	3

JAMES GUTHRIE, Accountant.

JOSEPH COWEN, Chairman.

Newcastle-upon-Tyne, 10th January 1854.—Examined and found correct.

THOMAS HEDLEY,
GEORGE DAVISON,
ROBERT ECKLESS,
JAMES SMITH,
} Auditors.

STATEMENT of ACCOUNTS of TYNE PIERS FUND, for the Year ending 9th November 1853.

		£	s.	d.		£	s.	d.
To pier dues on foreign Vessels:—					By W. H. Smith for collecting dues at South Shields, to December, 1852	5	9	8
Newcastle 80,139 tons	£667 16 8				By Messrs. Lambert, printing receipt forms	2	10	3
North Shields 15,311 tons	127 12 2				By steamboat men and pilot attending Mr. Walker, Admiralty engineer, on survey	8	0	0
South Shields 887 tons	7 7 10				By C. H. Brooks, for assistance to the engineer	2	5	0
		802	16	6	By J. & M. Clayton, law bill	19	19	9
To pier dues on coasting vessels:—					By Tyne improvement fund, for 2-5ths of expenses connected with obtaining Tyne Improvement Act, 1852, and for pier expenses	1,770	4	8
Newcastle 2,080,302 tons	8,667 18 6				By balance	8,841	17	3
North Shields 126,249 tons	526 2 9							
South Shields 162,392 tons	426 12 8							
		9,620	13	11				
		10,423	10	5				
To interest on banking account with Northumberland and Durham District Banking Company to 9th November 1853		226	16	2				
	£	10,650	6	7	£	10,650	6	7

Balance Sheet of Tyne Piers Fund, 9th November 1850.

	£	s.	d.		£	s.	d.
To Tyne piers fund account for revenue	13,746	14	6	By Northumberland and Durham District Banking Company	13,739	6	0
				By cash in treasurer's hands	7	8	6
£	13,746	14	6	£	13,746	14	6

James Guthrie, Accountant.

Joseph Cowen, Chairman.

Newcastle-upon-Tyne, 10th January 1854.—Examined and found correct.

Thomas Hedley,
George Davison,
Robert Eckless,
James Smith,
} Auditors.

State of Northumberland Dock Account, to 9th November 1853.

	£	s.	d.		£	s.	d.
To principal sums advanced on the following mortgages of the dock dues, bearing interest at 4 per cent. per annum :—				By parliamentary and law charges account:—			
Security for £5,000 0 0				Solicitor's charges and stamp duty on mortgage securities £101 1 0			
Security for 5,000 0 0				Tyne Improvement Fund, for two-fifths of expenses of obtaining Tyne Improvement Act, 1852, and for dock expenses 1805 4 8			
Security for 3,600 0 0					1,906	5	8
	13,600	0	0	By engineering expenses:—			
To interest account, for interest on banking account to date	55	15	0	John Plews, for preparing working drawings, &c.	1,000	0	0
				By David Thornbury, paid him on account of his contract	4,000	0	0
				By balance in Northumberland and Durham District Bank	6,749	9	4
£	13,655	15	0	£	13,655	15	0

James Guthrie, Accountant.

Joseph Cowen, Chairman.

Newcastle-upon-Tyne, 10th January, 1853.—Examined and found correct.

Thomas Hedley,
George Davison,
Robert Eckless,
James Smith.
} Auditors.

Appendix No. 8 *d.*

Appendix No. 8 *d.*

NORTHUMBERLAND DOCKS at the HAY HOLE.

The funds for the execution of the works of the Northumberland Docks at the Hay-hole are provided by dock rates, on the credit of which the capital necessary for the completion of the works is being advanced.

Newcastle-upon-Tyne, January 11, 1855.

Appendix No. 9.

No. 9.

LETTER to HER MAJESTY'S COMMISSIONERS for the River TYNE from a Minority of the Tyne Improvement Commissioners.

To Her Majesty's Commissioners for the River Tyne.

GENTLEMEN, Shields, 22d Jan. 1855.

THE Commissioners appointed under the Tyne Improvement Act, 1850, who addressed the letter of the 3d June to Sir James Graham, and the memorial of the 3d Agust to the Secretary of the Admiralty, respectfully submit in reply to the letter of your Secretary of the 5th December, and to the letter adopted by the majority of the Commissioners at their meeting on the 11th January, as follows:—

1st. They believe that they shall establish to your satisfaction, that the Board of Commissioners, as constituted by the River Tyne Improvement Act, 1850, has not worked efficiently, but, on the contrary, has pursued the system of encroachments on the tidal area, and the mismanagement of the river, which it was the object of that Act to obviate.

2d. Works as mentioned in the letter of the majority of the Commissioners above referred to are proposed or in progress; but other works and encroachments, detrimental to the navigation of the Tyne, have been executed, or are in progress or proposed, and we object to many of the proceedings of the Commissioners in reference to these works, and to the omission of works and duties, upon grounds stated in the letter of the 3d June, and in the memorial of the 3d August, and at meetings of the Commissioners, all which grounds are well known to the clerk, and to those who have attended the meetings of the Commissioners.

3d. It will be our duty to submit to you, that the navigation of the Tyne and the interests of the public are prejudicially affected by the method of proceeding with the works, and that the Board of Commissioners have succeeded by bare majorities in frustrating the recommendations of the successive Admiralty inquiries, and the intentions of the Legislature in passing the River Tyne Improvement Act of 1850.

We are, &c.

WILLIAM PURDO, R.N.,
JAMES C. STEVENSON,
WILLIAM LINSKILL,
M. POPPELWELL,
JOSEPH STRAKER,
Tyne Improvement Commissioners.

Appendix No. 10.

No. 10.

A MEMORIAL to HER MAJESTY'S COMMISSIONERS for the River TYNE from the Mayor, Aldermen, and Burgesses of the Borough of Tynemouth, 24th Jan. 1855.

To the ROYAL COMMISSIONERS appointed to inquire into the Proceedings of the Commissioners under the Tyne Improvement Act, 1850.

The Memorial of the Mayor, Aldermen, and Burgesses of the Borough of Tynemouth, in the county of Northumberland, showeth,

That the borough of Tynemouth, containing about thirty thousand inhabitants, is situate on the north bank of the River Tyne, and possesses a river frontage of nearly four miles in extent from the mouth of the river upwards, and with the borough of South Shields, containing a similar amount of population and situate immediately opposite to the borough of Tynemouth, forms the deep-water harbour of Shields, where all vessels of large burden and heavy draught of water must take up their berths to load and discharge.

That the borough of Tynemouth is essentially a maritime borough, by much the larger portion of its population being directly engaged in and dependent upon maritime pursuits, and the inhabitants of the said borough are in consequence very deeply interested in the preservation and improvement of the river and harbour.

That prior to and up to the year 1850 the management of the river from the sea up to the limits of the tidal flow, being a distance of about sevnteen miles, was exclusively possessed by the Corporation of Newcastle, who were also the exclusive recipients of the dues levied on ships and goods carried in ships using the river, which dues they claimed and exercised a power to dispose of as they thought fit, and in fact applied the largest portion of them to the private purposes of the town of Newcastle; and they in addition laid claim, and still lay claim, to the ownership in feè farm under the Crown of the bed and soil of the river within the above limits.

That for many years prior to 1850 the Corporation of Newcastle had actively

Appendix No. 10.

pursued a system of making solid embankments of large portions of the bed of the river, in front of river side property belonging principally to themselves thus gaining very large and valuable additions to their private property at the expense of corresponding diminutions in the tidal receptacle of the Tyne, and corresponding narrowings of the common and public highway of the river.

That very serious injury had thus been caused to the navigable channel of the river, and great fear was entertained by the inhabitants of Tynemouth that, in case the system then pursued by the Corporation were not checked, the deep-water harbour of Shields and the bar would become to a great extent choked up with sand and very greatly deteriorated, as experience had proved to have been the case in all other tidal harbours where such a system of abstraction of the tidal space had been pursued.

That, with the view of putting a stop to the mischief which was thus going on, and also with the view of compelling the application of the river dues to river purposes, applications to Parliament were prosecuted in the year 1849 and 1850 which ultimately led to the arrangement embodied in the Tyne Improvement Act, 1850, by which the future management of the river was vested in eighteen Commissioners, namely six to be appointed annually by Newcastle, two by Gateshead, three by Tynemouth, and three by South Shields, with four life Commissioners named in the Act, and the dues, with the exception of five-eighths of the principal due, called the coal due, were directed to be paid over to the Commissioners so appointed, and to be applied exclusively for purposes of river conservancy and improvement.

That, since the creation of the Tyne Improvement Commission, the most strenuous efforts have been used by the Commissioners appointed by your memorialists to obtain the abandonment by the Commission of the unsound and ruinous system of river management which had been practised by the former conservators, but in these efforts the Commissioners appointed by your memorialists have invariably been outvoted and defeated by the Commissioners resident in and appointed by the boroughs of Newcastle and Gateshead, who form a majority of the Commission, as of the life members named in the Act two were appointed by the borough of Newcastle.

That the Tyne Improvement Commissioners are in consequence continuing to pursue the same course which led to the interference of Parliament in the year 1850—the enclosures of the tidal space by embankments of solid land are proceeding from day to day under their sanction, and the interests of the river and harbour entrusted to their charge are becoming very greatly imperilled, by the very process which is producing an enormous increase to the private estates of the Corporation of Newcastle and other landowners on the river banks.

That, in the opinion of your memorialists, the great reduction in the tidal space thus in course of process cannot fail most seriously to injure the deep water berthage of Shields harbour, and to produce an injurious diminution of the depth of water on the bar—results the prospects of which your memorialists cannot entertain without the greatest anxiety and alarm.

That it appears impossible to afford any effectual remedy for the grievances complained of without a reconstruction of the Tyne Improvement Commission, so as to vest in the inhabitants of the seaward boroughs, or in independent Commissioners representing the national interests in the deep water harbour of Shields and Tynemouth bar, the necessary powers for redressing, so far as practicable, the evil which has already been committed, and preventing the continuance of the mischievous course of conduct which the Commission as at present constituted seems determined to pursue.

Your memorialists, therefore, respectfully urge that you will be pleased to give the representations of this memorial your best consideration and examination, and to recommend in your report the adoption of such measures by Government as will afford an adequate remedy for the grievances complained of.

Given under the common corporate seal of the Borough of Tynemouth, the twenty-fourth day of January 1855.

THOS. C. LIETCH,
Town Clerk.

No. 11.

Appendix No. 11.

RESOLUTION adopted at a Meeting of the South Shields Shipowners Society, 20th January 1855.

At a meeting of the members of the South Shields Shipowners Society, held at their Office, on this 30th January 1855, JOHN TWIZELL WAWN, Esq., in the chair, it was unanimously resolved,

That, in the opinion of this meeting, the shipowners of the Tyne (who are heavily taxed) are inadequately represented in the River Tyne Commission, and that proper measures be adopted in order to give that body a fair representation in the management of the river, and to accomplish that John Twizell Wawn, Esq., be respectfully requested to wait upon the Royal Commission now meeting in Newcastle, to state to that Commission the opinion of this association on the subject.

By order of the Meeting, GEO. POTTS, Hon. Secretary.

Appendix No. 12.

No. 12.

TWO LETTERS, addressed to the Chairman of the River Tyne Royal Commission, on the subject of the Piers at the mouth of the River Tyne.

To the Chairman of the Royal Commission of Inquiry into the Management of the River Tyne.

SIR, North Shields, February 3, 1855.

PRESUMING that it lies within the province of your Royal Commission to inquire into and decide whether works, now in progress, or about to be constructed, will be beneficial, or otherwise, to the navigation of the river, I beg most respectfully to call the attention of your honourable Board to the plan for the construction of piers at the entrance of the Tyne, and at the same time to enter my protest against the manner in which it is proposed to carry out to sea the north pier, to a distance equal to, if not exceeding, the extent of the south pier.

The flood-tide on this coast comes from the north, and flows along the coast to the southward; thus the piers running out into the sea in a direction due east, they will be placed at right angles to the course of the stream, during both the flow and the ebb of the tide. Now, as I have already stated, the tide of flood coming from the north, in a direction at right angles with the line of the piers, whilst at the same time the *north* pier is carried out to an extent equal to that of the *south* one, the obvious and necessary consequence will be, that the stream of the flood tide *will pass* the *pier ends*, and thus none of the original impulse of the tidal wave will be imparted to the stream which enters between the piers; the current which will run into the river being merely the effort consequent on the gravitating fluid seeking to maintain its level. Besides the great loss of power in the tidal current arising from the above cause, an eddy will be created round the end of the south pier, in consequence of the stream of flood passing to the south of both piers ends, before any perceptible effect is made on the direction of its course; it will then deviate to the westward, and, describing a cycloid, return along the extremity of the south pier, causing a strong eddy within the end of this pier, where any *débris*, or other matter held in suspension by the water, will be deposited, creating a dangerous shoal in the very centre of the navigation. Now, I beg most respectfully to suggest, that if the *north* pier was to terminate at the end of the rocks east of the Spanish Battery point, and so allow the south pier to extend out into the sea to a considerable extent beyond the termination of the northern one, the effect will be that the tidal wave coming from the *north* and impinging on the *north face* of the *south pier*, will unite with the gravitating current before described by me as entering the river, and will thus impart to it a great proportion of the active impulse of the stream of flood, giving to it all the energy of the original tidal wave, by this means a much larger quantity of water will be forced into the river than can by any possibility be admitted by the *artificial* current, which will exist should the north pier be carried out to an extent equal to the south one. I would instance many parts where adjacent ports have a great difference in the rise of the tide within them, in my opinion entirely consequent on the different angles at which the course of the tidal stream along the coast, and the line of the direction into the rivers intersect each other, but it is much beyound the scope of this letter.

I beg, therefore, to conclude by asking your kind consideration to my suggestions.

I have, &c.

C. H. GREENHOW.

To the Chairman of the Royal Tyne Commission.

SIR North Shields, February 6, 1855.

The committee of the "Shipowners Society" of this port beg most respectfully to call the attention of your honourable Commission to the very great and apparently unnecessary delay which is taking place in the construction of the piers at the entrance of the Tyne.

The shipowners have had imposed on them for more than two years a tax for defraying the expense of constructing those piers, considerably over 20,000*l.* being now accumulated for that purpose; and they feel that justice has not been done to them, on account of the dilatory manner in which the whole proceeding is conducted; they would merely remark "en passant" that if they are to derive any benefit from the piers, it is obvious that the sooner they are completed the better.

The committee also beg to call the attention of your Commission to the proposed plans for the construction of those piers, and to state that, though they do not pretend to any knowledge of engineering, yet having considerable practical experience as nautical men, they feel convinced, that the south pier ought to extend out to sea some distance further than the northern one, in order to intercept the flood-tide (which comes from the north), and at once divert it into the harbour. Should the two piers, north and south, extend to equal distances, the tide, flowing directly across their ends, will pass them, and return with an eddy; so not only will it lose strength, but also create a shoal within the end of the south pier, which in our opinion will interrupt the navigation, and render the entrance of the harbour dangerous.

We would also respectfully submit to your consideration, whether the shipowners, who contribute largely by direct taxation to the funds of the river commissioners, ought not to have a voice in the application of the money, by having a fair number of representatives on that commission to be elected by the body of shipowners. Appendix No. 12.

Trusting your honourable commission will give your kind consideration to the above suggestions,

I have, &c.

Robert Pow, Chairman.

No. 13.

Appendix No. 13.

Report by W. A. Brooks, Esq., C.E., Engineer to the Corporation of Newcastle-on-Tyne, recommending Deep Water Docks at the Mouth of the Tyne, between North Shields and Tynemouth.

Sir, Guildhall, Newcastle-on-Tyne, 9th October 1845.

I have to request the honour of your attention to the accompanying plan, which has delineated on it a portion of my views for the improvement of the river Tyne, and for affording increased accommodation to the shipping of the port. It is possible that your committee may deem it advisable to call the attention of the council to the subject at the present time, seeing that strenuous exertions are being made to draw or divert to other ports a large portion of that trade which may be considered legitimately due to the port of Newcastle, from its superiority as a harbour and the facilities offered to commerce by the immense marine belonging to it; the latter causing Newcastle to rank as the second port of Great Britain in this respect. The Tyne as will be seen by the chart accompanying this report not only at present possesses long ranges of deep water berths, adequate for fleets of several hundred vessels, but likewise possesses in itself elements for affording almost any probable amount of increased accommodation which may be required, by the formation of docks, in the well adapted natural tidal receptacles of Jarrow Slake and Coble Dean, and also in the spacious area exposed at low water between the Low Lights and the Spanish battery at Tynemouth. It is, however, to this latter site that I wish, as engineer to the corporation, to be enabled to draw your serious attention, as the course of execution of docks at this place would place at disposal abundant materials for effecting an important improvement at the mouth of the harbour, by the formation of a pier on the north side, running directly eastward from the rocks under the Spanish battery.

Of the great natural facilities offered for constructing docks either on the east or west side of Jarrow Slake little need be said, as the advantages thereof are generally acknowledged; and the execution of a spacious dock in this locality is necessary, not only to afford accommodation to the present trade, but to that which by the recent improved railway communication will be drawn to it from the district west and south-west of the Wear.

Should difficulties arise as to the execution of the excellent dock on the east side of the Jarrow Slake, for which an Act of Parliament has been already obtained, it will be seen that the western side of the Slake will, by the plan of docks suggested by me, afford accommodation ample for the shipment of almost any quantity of coal from the south-west coal-field of Durham, as well as for that which now finds its way to the Tyne as the nearest and best port.

The northern boundary or quay of these projected docks will also assist to carry into effect the views recommended by me to the council, for the improvement of Jarrow Reach. On the same plan I have delineated my conceptions as to the arrangements which should be adopted on the construction of docks at Coble Dean, should the excellent deep-water shipping place at Hayhole be found insufficient to supply the trade carried on in that vicinity.

On the bar of the Tyne, there is usually to be found, at low water spring tides, a depth of from eight to nine feet, and the flow is from 15 to 16 feet in ordinary spring tides, and 18 feet with strong winds from north or north-west; the depth on the bar at high water ranging between 23 and 25 feet; during neap tides the depth is about five feet less.

Taking into calculation the great draught of a large proportion of the marine of this port, an enormous advantage would accrue were they enabled to sail irrespective of the period of spring tides, or of the diminution of the depth which is created by the scend of the sea, which almost always makes the available depth less by two or three feet than in a perfectly calm sea; hence the importance of adding to the present depth on the bar, which I consider to be practicable for the following reasons.

A close survey of the mouth of the Tyne shows that a diminution of the power of the ebbing waters to maintain a deeper channel over the bar, has taken place from two causes, which are capable of being removed by the plan propounded by me.

The first arises from the discharge taking place over too wide a surface. Thus all will readily admit that the great body of the tide which ebbs out over the rocks under the Spanish battery, north of the main channel, being a width of 500 feet, must diminish the useful effect which it would produce if discharged with the remaining volume through the main channel, where the bed consists of sand.

Appendix No. 13.

The second cause of diminution of depth in the main channel, arises from the existence of another channel, which usually has about a foot less water through it, a small bank of sand dividing the two channels.

The direction of the ebbing waters being to the north, it must be evident that a very great portion is uselessly expended in its passage over the Black Middens and rocks under the Spanish battery, which latter rocks form in truth part of the bed of the embouchure of the Tyne, and it is for the purpose of preventing this loss of useful power that I have planned a northern pier, commencing or abutting against the cliff at the Spanish battery, and extending across the roads in a southerly direction for five hundred feet, then pursuing an easterly course for 1,600 feet, as per plan, and terminating seaward in 15 feet depth at low water of spring-tides.

The construction of this pier must concentrate the energy of the ebb-tide upon the bed of the main channel, and effectually remove any bar or deposit from its present position. Whatever bar may remain, will be forced farther out to sea, or into deeper water, where it will be exposed to the influence of a stronger passing current. There is a natural depth or condition of the bar of a river which is due to the volume of back waters it possesses, and the manner in which the discharge of the same is affected by the presence of inner bars or shoals ; but it is clear that the state of this sectional area on the bar may be materially reduced as to available depth of water by any enlargement of the width of the channel, or mouth, or division of the main channel into several smaller ones. The depth over the bar of the Tyne, which the natural power of its ebbing waters is capable of maintaining, is at present reduced by the dispersion of the current over too great a width.

The concentration of the useful effect of the ebb-tide on the bar, can only be produced by the construction of a pier on the north side of the river, as proposed by me.

For this purpose a pier on the south side, as proposed by the late Mr. Rennie, would be useless, because the course or inclination of the current of the ebb is not at all in that direction.

During the ebb the sands on the south side are in an eddy tide, or in comparatively slack water, and a deposit then takes place of that vast quantity of sand which is swept from off it by every previous flood-tide, a large portion of which latter has its natural passage into the Tyne over the Herd sand. The operation of the flood-tide, or its scouring effect upon the Herd sand, is well known ; but it does not follow as a matter of course, as is imagined by many, that any diminution of the depth of the navigable channel above takes place from this cause ; my own opinion is, that the depth is not reduced by such sand being carried up the river, because it is quite clear that the whole is returned on the ebb, and either re-deposited on the Herd or carried out to sea.

If this were not the case, the main channel to sea would be through "the wheel." If this were not the case, the Tyne would have been choked up many years ago.

The power of the ebb to return to sea the sand brought in by the flood is greater than the power of the latter to accumulate it within the river; hence the main channel is always to be found in the direction of the strength of the ebb. Some persons imagine that the power of the flood-tide to move sands is greater than that of the ebb, because they observe some sands which, alive on the flood-tide, are found hard on the ebb-tide ; but they do not carry their observation a little further, which, if they did, would compel them to conclude that the cause of the firmness during the ebb is, that the sands happen to be out of the direction which the current of the ebb takes, and are solely exposed to the strength of the flood-tides, such as the Droitwich sands and the Herd sand, which are all hard on the ebb, and alive on the flood. It is also erroneous to conclude that the ebb is greater in power than the flood-tide, because the duration of the ebb-tide in some rivers is found be considerably greater than that of the flood-tide. Its preponderative power arises from other causes ; the fact is, that it is that very excess of duration which diminishes the power of the ebb. My readers will agree with me, that the same volume of water must be more effective if discharged in six hours than in seven : if discharged in six hours, or during the natural period of the ebb, there can be no confliction with the flood-tide ; but when the discharge is extended over a period of seven hours, the last of the seven must be during the period of the first hour of the flood-tide, with which the discharge must be in opposition and attended with injurious consequences. I have in my investigations into the state of the river invariably found the greater the period of the discharge of the ebb exceeds the period of the upward or flood current, so much worse is found to be the state of their bars.

If a pier were made over the whole of the length of the Herd sand, it would not prevent the entrance of sand into the Tyne, because the flood would still derive an abundant supply from the sandy bed of the sea, without the bar to the eastward.

The pier on the Herd sand, as planned by the late Mr. Rennie, would (if constructed) have the effect of forcing heavy seas up the river during gales from the east and north.

Aware of the range of sea which would attend the formation of a continuous line of pier from the bar to the narrows, I have proposed effectual means to check the inroad upon the tranquillity of the port, which such a construction would produce : the north pier is therefore made to abut or commence against the cliff under the Spanish battery, and an area of eighteen acres is left to the westward, or between it and the proposed docks.

This space of eighteen acres will be found of sufficient extent to allow all waves to subside within it after passing over the bar.

Another cause of tranquillization will be found in the deepening of the present channel which will result from the enclosure of the area occupied by the docks and western tidal basin. It will be observed from the accompanying chart, that the soundings rapidly increase in depth outwards, from the point fixed by me as the extremity of the north pier: thus at 40 fathoms' distance the depth is 21 feet, and at 80 fathoms there is a depth of 24 feet, at low water of spring-tides. Appendix No. 13.

Vessels running for the harbour in heavy gales from the north-east will therefore be in grey water until almost close to the pier end, which they may boldly steer for, and immediately find themselves in shelter.

From the security which will be afforded by the north pier no future casualties need occur on the Herd sand, on which vessels are now occasionally lost, owing to their anxiety to give a wide berth to the rocks under the Spanish battery. While the approach to the port is thus rendered more safe it must also be manifest that, by the protection of the north pier, vessels will be able to clear out to sea under circumstances which would be impracticable in the present state of the entrance.

From the long attention which I have given to the subject of refuge harbours, I doubt the not increased safety to mariners navigating the north-east coast which would be afforded by the construction of this pier at the mouth of the Tyne, would be hailed as one of the greatest boons that could be conferred upon them.

The large space between the tidal basin and the Low lighthouse, I have proposed to convert into a dock for colliers, having an area of 31 acres, but divided into three parts by two quays, each of 200 feet in width, on which staiths and slidings will be constructed.

These docks will have a connexion with the eastern tidal basin by means of double gates, which will be available in smooth weather, or during off-shore winds; at other times the communication will be solely by means of the western gates opening into a tidal basin of eight acres, formed partly out of the Muscle Scalp, and partly out of the low spit of land on whlch Clifford Fort is situated.

Vessels running for the docks in tempestuous weather will stand on until abreast of the Low light, and then, bearing up to the northward, enter the slack on the west side of the Low light, and thus reach the western tidal basin and docks in still water, from whatever quarter the gale may be blowing at the time.

The whole of the works for the docks will be a matter of extraordinarily easy execution, in comparison to the heavy expenditure usually incurred on such works.

The whole of the works for the docks being situated on a base of rock and hard clay, which bares at low water of spring-tides, will be enclosed in the first instance by outer walls forming part of the intended quays, and the docks subsequently excavated to a depth of ten feet below low water, so as to allow vessels of the largest draught to lie afloat during neap-tides. The docks (exclusive of the tidal basin) will afford accommodation to above 300 large ships, and quay berths for above fifty ships to, at one time, take in cargoes.

The expenditure which will be incurred will be under 250,000*l*., and the advantages which will be received in return may thus be shortly summed up :—

1st. Greater depth of water on the bar.

2d. Increased security on arrival at, and departure from, the port.

3d. The power of getting to sea under circumstances which vessels are now unable to avail themselves of.

4th. Increased safety within the port by the withdrawal of a large portion of the shipping which now frequently crowd the pool between North and South Shields, in which occasionally from 700 to 800 ships are moored.

5th. An immense increase of accommodation to the trade of the port, and the certainty of drawing to it a superior class of vessels, which will not venture to take in their cargoes unless sure of being able to do so afloat at all times. It is obvious that facilities exist for the formation of docks upon a smaller scale and consequent diminished expenditure; but I see no reason to doubt the whole being required, and proving ultimately highly remunerative as well as useful.

I have, &c.

To the Chairman of the River Committee. Wm. Alex. Brooks.

No. 14.

Appendix No. 14.

Report on proposed Coaling Staiths at the Low Light Shore, North Shields.

Admiralty Harbour and Railway Department,

Sir, 15, Duke Street, Westminster, 15th November, 1848.

In compliance with their Lordships' instructions to inquire into the plans of the proposed shipping places at the Low Light shore, at North Shields, I have the honour to report that, having given notice of my intention to the Mayor and Corporation of Newcastle, the local conservators of the Tyne, and to the promoters of the measure, I held a public Court of Inquiry into the subject on the spot, on Tuesday the 1st August last, at which all parties interested in the question were invited to be present.

The meeting was attended by the Mayor of Newcastle, the chairman and several members of the river committee, and the engineer to the corporation; also by the

Appendix No. 14.

solicitor and engineer to the promoters, several coal owners interested in the Hartley, Blyth, and Bedlington coal field, and many of the most influential ship owners and other gentlemen of North and South Shields. There were also present the Master of the Trinity House, with many of the pilots, the harbour masters and their assistants, and several others interested in the welfare of the port.

Plans of the project, including a general plan of the coal field with the surrounding district, and of the line of railway, were laid on the table. There were also detailed plans of the proposed pier at the Low Light shore; of the harbour of Shields, showing the position of the tiers of shipping at their usual moorings; the Admiralty chart of the entrance of the Tyne of 1838, made by Mr. E. K. Calver, under the directions of Captain Slater; and Giles's plan of the river of 1813–16, made for Mr. Rennie, with numerous sections.

The inquiry occupied seven hours, and the whole of the evidence, together with the several memorials, &c., have been printed by the promoters, and a copy of it accompanies this report.

The object of the promoters, who are lessees of a great part of the steam coal field, north of the Tyne, is (as was very clearly and fairly stated by their solicitor) to obtain a better outlet for their coal than is afforded by the harbours of Blyth and Seaton Sluice, at which places it has hitherto been shipped. To effect this object, it is proposed to make a railway about five miles and a half in length, connecting the coal field with the most convenient point of access at North Shields, and to form staiths for the shipment of coal at the Low Light shore, near the mouth of the harbour.

In order to lessen the inconvenience likely to be caused by the loading of ships in the usual manner at the outside of the staiths, the promoters are willing, at the suggestion of the engineer to the corporation, to incur the extra expense of erecting a solid pier or breastwork a short distance without the present low water line, and to excavate a channel between it and the shore, where vessels may load, without interrupting the ordinary navigation of the river.

It was stated in evidence, that there is an extent of about 8,500 acres of coal in Bedlingtonshire, a large portion of which is steam coal, and if the requisite facilities were afforded, that 150,000 chaldrons of this coal might be shipped annually on the Tyne, thereby materially increasing the revenue arising from the river. It was also stated that the only good access to the Tyne from this district was by the proposed railway, that the line would be a great convenience to the public, and that the communication was one which, in the opinion of Mr. Robert Stephenson, C.E., ought to be made. The project was further supported by a memorial in its favour from twenty-two merchants, ship-owners, proprietors, and tradesmen in North Shields.

The proposed breast-work is to extend 390 feet in an east and west direction, or nearly parallel to the course of the river, its eastern end to be at a distance of 250 feet, and its western end at 95 feet, from the high water line at North Shields quay; it is to be 22 feet wide, of close piling; and its outer edge will stand in a depth varying from seven to 11 feet at low water, and in from 22 to 26 feet at high water, spring tides. A channel will be excavated inside 55 feet wide, and eight feet deep at low water, to extend some distance up to Powburn, which channel it is proposed to keep open by a reservoir and sluice at its north-eastern extremity, and by dredging. As this erection and the shipment of coal at this spot would interfere with the berth usually occupied by vessels of war in Shields harbour, the river committee, although not unfavourable to the project, very properly referred the question to the Admiralty for their Lordships' decision, transmitting at the same time reports from the harbour master, the committee of sea pilots, and the Trinity House, decidedly opposed to the measure.

The case of the promoters, with respect to the river, is mainly supported by the opinion of the engineer to the corporation, who states that, although the breastwork will encroach in some degree upon the harbour, this evil will be compensated by the benefit which may be expected to arise from the increased scouring action caused by the contraction of the channel, whereby it is hoped sufficient velocity of tide will be obtained to remove a portion of the Middle Sand, which inconveniently narrows the channel at this point. Such also appears to be the expectation of the sailors, who gave evidence in favour of the scheme; and from the frequent reference made to the works at Bill Point, six miles higher up the river, it would seem that all parties ground their expectations on the successful result obtained at that place.

An attentive examination of the different circumstances and conditions of the river at these two sites, leads me to the conclusion that this expectation would not be realized.

At Bill Point, or rather in St. Anthony's Reach, immediately above it, the ebb-tide was formerly deflected from the convex south shore, and thrown into the deep bight on the north side, just above the Point; in like manner the flood-tide in coming up Bill Reach was thrown off by Bill Point, and forced into the bight on the opposite shore; thus leaving a spit between the two tide-sets known by the name of the Bill Sand, extending over five-sixths of the high-water width of the river, and narrowing the navigable channel at one time, it is said, to 130 feet, while the reaches above and below Bill Point lay nearly at right angles to each other. Mr. Brooks, C.E., engineer to the corporation, boldly grappled with this formidable evil, and by planting groynes or jetties from 150 to 250

feet in length completely across the deep-water channel in the bight, he has entirely changed the course of the river, scoured away a large portion of the Bill Sand, and left the mariner a comparatively easy navigable channel, an undeniable benefit to the navigation of the river.

It will be observed, in the above case, that the whole strength of the ebb-stream in a narrow part of the river was brought to bear upon the sand in order to produce the required effect. Prior, however, to the groynes being placed, an effort was made to straighten the channel by removing a portion of Bill Point. The channel at this time was 150 feet wide (measured from six feet to six feet at low water) with the whole strength of the ebb-tide passing between the Point and the end of the sand. On BillPoint being partially removed, we learn, from Mr. Brooks's report and sections, the sand actually advanced 20 feet across the river, in spite of the strong ebb-tide, and reduced the navigable channel from 150 to 130 feet.

Now the river Tyne in Shields harbour is more than double the width that it is off Bill Point; the site of the proposed breastwork is in a recess or eddy, in which the ebb-stream is comparatively feebly felt, and the flood-stream not felt at all; and the distance from the breastwork to the point of the Middle bank is 220 feet, or nearly double that at which the scouring action of the tide was found unavailing at Bill Point.

Experience, then, of what has occurred elsewhere in the river, would hardly justify us in expecting any beneficial effect upon the Middle bank, from the work in question. It will be seen shortly that experience of what has occurred at the site of the proposed breastwork during the last thirty-five years, holds out no better hope.

The inner part of the entrance of Shields Harbour is obstructed by a large sand-bank, called the Insand or Middle Bank, projecting from the south shore, and extending two-thirds across the river. When Giles made his large survey of the Tyne, under the direction of Rennie, in 1813, the distance from the low-water line of the Low Light shore to the six-feet edge of this sand was 320 feet; the greatest depth of the channel 18 feet, and its sectional area 480 yards. Since that time, we learn from the evidence, and the engineer's sections, that the low-water line has advanced about 40 feet into the river; that the site in question, at one spot, has shoaled from a depth of 15 to six feet; yet, at the same time, the spit of the middle bank has extended downward, and the width of the channel is reduced to 270 feet.

The accompanying sections show these changes more distinctly. They also show that the low-water widths of the entrance or navigable channel of the Tyne (between the six-feet edges), the greatest depths, and the sectional areas, were respectively as follows :—

From Giles's Survey in 1813.

	Width in feet.	Depth in feet.	Sectional area in yards.
At the narrowest part of the Narrows, opposite the Herd sand Beacon	330	29	740
At 100 yards farther in, opposite the watch-house	430	31½	1025
At 100 yards farther in, opposite the tail of the Middle ground and the centre of the proposed breastwork	300	18	410
At the same site in August 1848	250	18	370
At the same site, if the proposed breastwork be placed	220	18	340

It thus appears that, in the course of thirty-five years, the channel has been decreased 50 feet or one-sixth of the whole in width, and one-sixteenth in sectional area, and that the proposed breastwork would further decrease it one-fifth in width, and by one-twelfth of its present sectional area.

Now, it is through this narrow strait or channel, (much narrower than the entrances of many of our pier harbours),* that the whole of the loaded traffic and the greater part of the light traffic of the Tyne has to pass. From the custom house returns, it appears that, in the last year, 21,279 ships, with cargoes, sailed from the Tyne, and, including those in ballast, the arrivals were about the same, or a total of 45,500 vessels, not reckoning steam tugs, passed in or out. But even this number, large as it is, by no means gives a correct view of the movement of shipping in the harbour of Shields, as, after a slight detention by contrary winds, as many as 300 vessels have not unfrequently arrived in a single tide, and as many have sailed. The loaded vessels can only start within an hour or two of high-water, thus again limiting the traffic to a still shorter period. If, to this, we add the incessant passing to and fro of the steam tugs (as in easterly winds nine-tenths of the outward-bound ships would be towed to sea), a rapid tide, a river-fresh, and clouds of smoke, some notion may be formed of the scene of activity, bustle, and confusion presented by the entrance of Shields harbour during the hour and a half before and after the time of high-water.

A scene of activity, I fully admit, that is highly creditable to the commercial enterprise and energy of the shipowners, shipmasters, and pilots of the Tyne; but who, that knows the difficulties and hair-breadth escapes under which this traffic is carried on, even with all the resources of skilful pilots, could sanction for a moment the placing of an additional obstacle in a channel already narrowed far beyond what it should be, and far beyond what the trade of the Tyne has a right to demand?

* Kingstown entrance is 800 feet wide; Sunderland, 300 feet; Aberdeen, 300 feet.

Appendix No. 14.

Yet, it is here that it is proposed to place the breastwork, which, besides its effect in contracting the channel, would crowd this part of the harbour with the additional shipping required to carry (as the promoters state) 150,000 Newcastle chaldrons, or nearly 400,000 tons of coal, annually :—these cannot be taken at less than 2,000 sailings, and as many arrivals, yearly, in addition to the present traffic of the river, all which additional vessels would crowd the lower part of the harbour, waiting for their turn to haul in alongside the staiths for loading.

Although shipping staiths at the Low Light shore may be fairly objected to, yet no sufficient reason was adduced in evidence why the coal should not be brought to other parts of the Tyne. There is ample room for more coal staiths in Hayhole, a little higher up the river. A railroad, which might be connected with the coal-field, already exists, and, although there may be some difficulties in the way, it does not appear that there is any insuperable objection to its being made use of by the promoters. A far better scheme, however, would be to combine with the Coble Dean Dock Company and press forward the making of the Northnmberland docks (an Act for which was obtained in 1846), and lead the coal to that spot for shipment. Some financial difficulties seem to have stopped the measure hitherto, but it is now so obviously to the interest of all parties connected with Shields, and for the general benefit of the Tyne, that it is earnestly to be hoped the difficulties may be overcome. When it is remembered, that at one time during the last winter 778 vessels were crowded into Shields harbour, in an area of 146 acres at low water, or less than a quarter of a mile square, the necessity of some such relief to the shipping is manifest.

That great and mischievous changes have been going forward in the lower part of Shields harbour during the last fifty years, was clearly proved in evidence. Both Mr. Richmond, one of the oldest sailors and shipowners, and Mr. Robert Pearson, one of the oldest pilots, belonging to the port, bore testimony that a vessel drawing 17 feet water lay afloat, at the beginning of the century, near where the Low lighthouse now stands. The building of the lighthouse in 1810, the erection of the Whitley staiths, and the filling in of the life-boat ways, have all materially contributed to this result ; neither of the latter works should, on any account, have been permitted. The Whitley staiths should immediately be removed as an unsightly nuisance ; the life-boat ways should be opened out, the beach levelled, and the shore cleared of all obstructions. Every encroachment at this spot should be vigilantly and carefully guarded against, if Shields harbour is to be preserved for the traffic of the Tyne.

Considering, then, the already crowded state of Shields harbour, in which it appears that there were 778 vessels at one time last winter packed together in an area of less than a quarter of a mile square at low water ; that the river at the site in question has already been narrowed some fifty feet ; that at one point it has shoaled from a depth of 15 feet to six feet in half a century, which may be chiefly attributed to the erection of the Low lighthouse, the Whitley staiths, and the filling up of the life-boat ways on this shore ; that there is little ground for the expectation of the proposed breastwork causing the scouring away of the spit of the Middle bank ; that, owing to Custom House regulations, all foreign ships have lately been obliged to bring up near this spot, thereby aiding in blocking up the entrance ;—seeing the necessity of an open passage for the already enormous yet increasing traffic of the Tyne ; the danger of increasing the range of swell in the harbour in south-easterly gales ; that the proposed work would interfere with the berths usually occupied by ships of war, when in the Tyne ; that it would deprive the public of a useful beach for laying ships on to examine their bottoms, or to save them from going down in deep water, if brought in in a sinking state ;—considering, too, that, by aiding in carrying out the Coble Dean Dock scheme, a very great benefit would be conferred on the trade of the port ; it is impossible not to agree with the recommendation of the Master of the Trinity House, the majority of the pilots, and the harbour masters, that the navigation of the Tyne ought to be preserved free and uninterrupted, and that, instead of any additional works being erected at this spot, the removal of the Whitley staiths and all other obstructions from the Low Light shore is highly desirable.

The preceding remarks are made upon the understanding that the project in question is to stand alone. If it be intended, as has recently been suggested, that this line of breastwork should form part of a general plan for the improvement of the entrance of the river, whether by a continuous quay constructed along the face of North Shields, or by making docks outside the point to the eastward of Clifford's Fort, as has been proposed by Mr. Brooks, C.E., the subject will require to be reconsidered in connexion with the altered conditions and circumstances of the case ; but no hint of any such intention was given during the examination.

In the course of the evidence on this inquiry, some points were mentioned affecting the general conservancy of the river, which it is necessary to notice. And, first, the throwing over of ballast at sea, not far outside the bar, which appears to be a common practice. Some notion of the extent of this evil may be formed if we consider that, of the 21,000 arrivals in the Tyne annually, about 17,000 are in ballast, and if we allow 50 tons as the average quantity carried by each vessel, about 800,000 tons of ballast ought to be landed on the shores of the Tyne. By the harbour accounts of 1847 it appears that not 160,000 tons were so landed ; therefore far above half a million tons remain to

be accounted for, the whole of which is thrown over at sea, and a great part not far from the harbour's mouth. This reckless practice cannot but be fraught with danger to the entrance of the Tyne (as well as to the ship and her crew in case of a sudden off-shore gale), and should be immediately stopped, proper buoys should be placed to mark the limits, outside of which the ballast should be cast, and the full penalty which the Act imposes should be enforced against any vessel throwing over ballast nearer the shore than a depth of 10 fathoms at low water.

One cause assigned for vessels not bringing their ballast into the Tyne is the high price charged for its delivery there. The ballast dues for vessels entering the Tyne, whether they stop at Shields or go higher up the river, are claimed as a right of the corporation of Newcastle, and the charge appears to be 1*s.* 4*d.* per ton, if delivered by keel, and 1*s.* 10*d.* per ton at the quay. The nett receipts, last year, from this source alone, in addition to the 21,008*l.* of harbour dues, amounted to 6,801*l.*, which money it was stated is chiefly applied to municipal purposes connected with the city of Newcastle, and not expended in improving the river. It further appears, in evidence, that the contract price for delivering ballast does not exceed from 6*d.* to 8*d.* a ton. The complaints were loud and general against the first-mentioned exorbitant and impolitic charge, so far exceeding that at the neighbouring ports.

There is also great reason to fear that large quantities of ballast are thrown into the harbour, owing to the practice of permitting vessels, and particularly foreign vessels, to discharge ballast by night. The harbour masters should know something about this.

Another ground of complaint was, that there was not a self-registering tide gauge, nor even proper common tide scales, nor any regular record of the tides kept in any part of the river. There is little doubt but a throttling of the tide takes place somewhere in the narrows at the entrance of the river, yet no one can say from experiment where this point is; nor has there been any series of tidal observations made since Giles's survey in 1813, to show to what extent this takes place; nor what the difference of level between the surface of the sea outside the bar, and that of the river within, at the several periods of flood-tide, and at the several points of its course from Tyne bar to Newcastle bridge; yet such observations are essentially necessary, as a preliminary to any comprehensive plan for the improvement of the river.

Not only is there no such tide gauge, but there is not even a tide scale available for the common daily practical purposes of the harbour. What is wanted for this purpose is a distinctly legible and conspicuous tide scale near the entrance, showing at any moment the depth of water on the bar; the master of a vessel should not be compelled to trust to a pilot, however skilful, and still less to an imperfect tide table, which may or may not be in his pocket, for a knowledge of the depth over the bar; yet, in the Tyne, with, as we have seen, occasionally 300 arrivals or sailings in a day, and with an income of nearly 28,000*l.*, there is no tide scale to which he can refer.

Another point of great importance, which was warmly discussed, is the state of Tyne bar. As far as can be gathered from very conflicting evidence, the depth over it has not decreased since Giles' survey in 1813. If the entrance of the Tyne has not deteriorated, which admits of a doubt, the most that can be said of it is, that it has remained stationary during the last thirty-five years, while the entrance of nearly every other harbour along the coast has been improved. With a revenue from shipping and goods borne by shipping of 28,000*l.* a year, it seems incomprehensible that no attempt should have been made to improve the bar. It is not even known (as far as I could ascertain) of what material it is composed; there may be a substratum of rock, or clay, or gravel, or other stiff material, which acts as a nucleus for the sand and shingle to form upon, and which, if a channel were once fairly cut through it with a dredging machine, the daily tidal scour *might* keep open. The expense attending such an experiment would be comparatively trifling, and the benefit, if it did succeed, incalculable. The annual loss of property at the entrance of the Tyne (not to mention the loss of life), far exceeds the outlay that would be necessary, and fully warrants the attempt.

An inspection of the Admiralty survey of the entrance of the Tyne, of 1838, shows that the bar is only about 430 yards wide between the two-fathom edges, and very little cutting would open a funnel-shaped channel through it of 100 yards wide and 12 feet deep. There is also a second or inner bar, at about 860 yards within the inner edge of the outer bar, which should at all events be dredged through; it is but 70 yards wide, but it has a knoll or patch with as little as five and a half feet water over it, nearly in the centre of the channel; yet even this has been allowed to remain unmolested at the very threshold of a port that boasts itself as second only to London and Liverpool, in the British empire.

Although, as above stated, the Bill Sand has been greatly removed, several other sand-banks still obstruct the navigation of the river. Perhaps the most objectionable of them is the Insand, which so materially contracts the entrance and the harbour of Shields. As it is desirable to preserve the deep-water bight on the Low Light shore on the north side, it may be worth consideration whether some work, carried in a bold curve from the edge of the sand opposite the Herd Beacon to the old ferry boat landing at South Shields, might not aid to drive this sand away. By means of such works, the flood-tide might perhaps be forced into the same channel as the ebb, instead of wasting its strength as it now does, in the deep water pool on the south shore. But the dredging machine will also be

Appendix No. 14.

required on the north side of the narrows, where the projecting rocky shore and shingle heaps shoot the flood-stream across to the south shore, leaving Peggy's Hole, the usual man-of-war anchorage, in an eddy.

The powerful, and unceasing action of the tide invaluable as a scouring agent, does not seem to be sufficiently appreciated in the Tyne; no proper effort has been made to direct and assist it upwards; a loss of five feet rise and fall in a distance of twice as many miles, is permitted to exist between Tyne bar and Newcastle bridge; yet the amount of river water in its ordinary state, as compared with the tide, is utterly insignificant. The Tyne drains an area of about 1,100 square miles;* and supposing an annual fall of thirty-six inches of rain, which is a full estimate, and that only two-thirds of this amount be evaporated, the water carried to sea will not much exceed an average of three million cubic yards a day; whereas we learn, from Rennie's report, that the large quantity of twenty-seven million cubic yards are brought in twice a day in every spring tide, to fill the space between the bar and the bridge, without reckoning what goes above it, showing the immense importance of guiding and encouraging the tidal flow.

More than thirty years have elapsed since Rennie wrote his Report, and laid down lines, on an elaborate plan, for the improvement of the Tyne; during the greater part of this time the corporation of Newcastle have been receiving a princely income from dues on shipping and goods borne by shipping, yet how little has been done for the river! It is true that a capacious quay has been built at Newcastle, and three admirable hydraulic cranes erected, which do honour to their inventor; a straighter channel has been made through Bill Reach—a good quay is in progress at St. Peter's—several coal staiths have been carried out into deep water; there are numerous skilful pilots, an efficient and well-organised life-boat establishment, but, above all, tiers of Mitchell's invaluable screw moorings have been laid down in Shields harbour, and in some other parts of the river.

These, we readily admit, are good measures, and do great credit to the navigation committee, and their engineer, who have, we believe, made the most of the small means placed at their disposal. But no sufficient reason apppears why, with a revenue from river dues which amounted to 28,000*l.* last year,† no comprehensive plan of improvement has yet been undertaken by the corporation of Newcastle, who claim the title of conservators of the Tyne; why 70 acres of dry sand bank should be allowed to disfigure the bed of the river at low water; why Newcastle bridge with its nine arches, massive piers, and additional starlings, should be permitted to act as a dam to the flow of the tide; why quays on each bank should be left falling into the river; why Whitehill Point should still project most inconveniently into the stream; why no docks are formed to relieve the overwhelming pressure from shipping in Shields Harbour, and no effort made to deepen and improve Tyne bar. These are questions which, it would seem, the enterprising shipowners, who build such vessels as the "Marlborough," and the "Blenheim," and the immense shipping interest, which have raised the port of Newcastle to the rank of third in the British empire, have a fair right to ask, and to have answered.

JOHN WASHINGTON, Captain.

To the Secretary to the Admiralty.

P.S. An explanation is due to their Lordships, and to the promoters of the measure, for the delay that has occurred in furnishing this report, but the complete printed evidence did not reach me till the middle of September. I was then engaged in an examination of, and report on, the water of Urr in Kirkcudbrightshire, which was hardly finished when I was ordered to Caithness on an inquiry into the losses of fishing-boats on the east coast of Scotland, from which I have only recently returned.

Appendix No. 15.

No. 15.

Mr. RENDEL's Report to the TYNE IMPROVEMENT COMMISSIONERS.

GENTLEMEN, 8, Great George-street, Westminster, 11th October 1851.

Since the autumn of 1848, when I was first called on by the Corporation of Newcastle to survey the river Tyne, and furnish a plan for the improvement of its navigation, I have frequently had my attention directed to the subject. I have, however, deferred till now coming to any conclusive opinion upon it, not only from an anxious desire to weigh with the greatest deliberation my own conceptions, but also that I might first make myself thoroughly acquainted with the great mass of evidence that has, in the meantime, been given before Parliament and otherwise, on all the material points to be considered.

Aware that it is your wish to have as briefly as is consistent with distinctness the opinions at which I have arrived, I shall at once proceed to report upon the various improvements in the river which I think necessary and expedient—the nature and extent of the works required to ensure these improvements—the order in which they should be executed—and their probable cost; referring all who desire information as to the character of the inquiry I instituted before forming my opinions, to the accompanying Appendix.

First.—As to the various improvements which I consider necessary and expedient.

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* The basin of the North Tyne may be taken at 447 square miles; of the South Tyne, at 286 square miles; and of the Lower Tyne, at 398 square miles. Total 1,101 square miles.

† Besides about 6,000*l.* a year received by the Trinity House of Newcastle.

It will be apparent to you, who have witnessed the development of the railway system, that its tendency is to encroach on that important branch of the shipping interest engaged in the coasting trade. Further, that the competition thus commenced is giving rise to a struggle amongst the several ports in your neighbourhood, not only to meet the new and common rival, but also with each other for supremacy.

Many who have directed their attention to these questions, hold that the result will be a great increase in the size of vessels used in the coasting trade, and its concentration in those ports which can be made to offer the greatest facilities for the largest class of such vessels. I so far adopt these views myself, that I should not be prepared to recommend any large expenditure on the Tyne, if I did not consider its natural advantages such as, with suitable works, would insure its superiority over all the neighbouring ports, in regard to depth of water, ease of access, extent of harbour room, and length of inland navigation.

To increase the depth of water on the bar, and improve the entrance channel from thence to the Narrows, to the greatest extent practicable, should be your first care. For many years past, the depth at low water spring tides has varied, according to circumstances, from 6 feet 6 inches to 8 feet. I have no doubt but that a minimum depth of 10 feet to 11 feet may be permanently maintained; and this increase I consider necessary, seeing that the spring tides on this coast rise only from 13 feet to 16 feet, and neaps from 7 feet to 9 feet—that easterly winds bring a heavy sea on the bar—and that, owing to the crowds of vessels which occasionally arrive or depart on a favourable change of wind, it is of the greatest importance to increase the length of tide-time for passing the bar.

For the same reasons, as well as to guard as far as possible against the liability of vessels to get on the Herd sand and Tynemouth rock, it is absolutely necessary that the whole length of the entrance channel, between the bar and the Narrows, should be protected from the south-easterly winds.

Again, the cross-currents which produce the Wheel give rise to the Nine Feet bar, waste the energy of the flood and ebb-tide, and so largely contribute to the formation of the Insand, that some means must be adopted of turning them in an uniform and better direction.

Such, however, is the connexion of these several obstructions with one another, that the advantage offered by the great projection seaward of the Tynemouth shore, that the works best suited for the deepening of the bar may, without increased cost, be made most effectual in affording the required shelter for the channel, and in straightening the tidal currents to and from Shields harbour.

When the works show to what extent the bar can be deepened, I think it will be necessary to remove that portion of the stones which form the north-west end of the Nine Feet bar, to at least the same depth as the improved sea bar, and to such width as the new sailing channel may make desirable.

Within the Low Lights, I consider the following improvements necessary and attainable, namely:—the removal of the whole of the tail of the Insand, known as the Middle Ground, also of a portion of the Insand itself, thereby widening and straightening the navigable portion of the harbour within the Narrows, lessening the violent distortion of the flood and ebb-stream, and at the same time increasing their momentum, and consequently power, in this part of the harbour; important in the improvement of the river, not only on account of this its great value, but also as the point where the flood tide should receive its great impulse, so as to increase its column in the higher parts of the river, and where the current of ebb should be guided in the proper direction for the bar, and its whole power made to pass off with such an uniformity of stream as to increase its scouring power from the Narrows to the sea.

The next improvement in order is the removal of Whitehill Point. There is no obstruction in the whole river which I regard as more injurious to its tidal economy than this point. It forms the apex of the first great bend within the harbour's mouth—it suddenly contracts the width of the river from 1,400 feet to less than half that breadth—it directly produces the banks known as the Droitwich sands and Whitehill sands—and, from its being just on the flood-stream side of Jarrow Slake, it throws the current over the slake, and thus powerfully, though indirectly, aids the formation of that very objectionable shoal or river bar, known as Jarrow Sand.

Whitehill point must therefore be removed; and, as a part of the same improvement, a portion of Hayhole Point must be cut off, and the river below half tide level must be confined in a straight course by proper banks to Howdon on the north shore, and Jarrow Point on the south.

By these means, I have no doubt but that you would be able to maintain a navigable channel up to Howdon, having a minimum fairway depth of from 7 to 9 feet at low water spring tides, with the full time and sea range of tide.

Beside these advantages, I consider the importance of Hayhole as a shipping place should be further improved by the adjunct works to be hereafter explained.

Between Howdon and Bill Point the requisite improvements must be effected by "training" the river; that is, by confining its stream within a limited width, and in a direction that will insure the greatest uniformity of current for the ebb-tide and land waters, as well as for the flood-stream; thereby not only increasing the duration and

Appendix No. 15.

column of the latter in the higher reaches of the river, but also the power of the back-water, fresh and salt, to maintain an efficient scour and good navigable channel.

Whether this training should be done by groynes run off from each shore, or by guiding banks formed parallel to the channel—what should be the height of such groynes or banks, so as to insure the best results from the navigation as a highway, with the least interference with existing quays and shipping places on both shores of the river—are questions that will be properly considered under the head of "Proposed Works." I shall, therefore, only remark in this part of my report, that I consider it essentially necessary that the fairway channel should be improved to an extent that would give a slope to the low water surface of not more than 2 inches per mile, in any part between Howdon and Bill Point, thus increasing the tidal column at the latter place to 14 feet 9 inches at spring tides, or 2 feet 9 inches more than at present, and proportionably accelerating the time of young flood. (See the Tidal Diagrams in the Appendix).

At Bill Point I consider more improvement will be effected by blasting the rocks below low water, to the extent to which they have already been removed at high water, than by any further removal of the point between low and high water. The excavation at this point—the removal of a small portion of the almost opposite projection near Ewehole—of another small portion of the same shore at the Brandling Main staiths, and of a larger portion at Friar's Goose Point—joined with a proper training of the river between these places and up to Newcastle bridge, will, I have no doubt, with some dredging, effect an improvement that will reduce the slope of the low water surface to a maximum of $2\frac{1}{2}$ inches per mile for the whole distance between Bill Point and the town quay. This would give a tidal column at Newcastle bridge of 14 feet 6 inches or from 2 feet 6 inches to 3 feet more than at present, and hasten the time of young flood about an hour.

Assuming the training of the stream to be effectual, and the works generally of the kind I shall propose under the next head, I do not doubt but that the fairway channel will be maintained so as to give a minimum depth at low water of from 6 to 7 feet, and that such depth will extend to a good navigable width.

From Newcastle to Hedwin Streams, the present head of the tideway, and to which I understand your jurisdiction extends, the river is also capable of great improvements. This remark applies not only to its navigation, but also to its usefulness as a receptacle for tidal back-water, and as a drain for the lands and the discharge of the flood waters, so as to act with greater power in scouring the channel down to the sea. Its improvement would, however, involve the rebuilding of Newcastle bridge; and to make the navigation efficient, the two centre arches of the new bridge should swing on a central pier, each opening being not less than 45 feet.

The other improvements which should, if any, be undertaken, would consist in proper training banks for the whole distance—in widening the north channel and stopping up the west end of the south channel at King's Meadows—training the outfalls of the Team and Derwent rivers—forming a new channel from Scotswood to the bend above Lemington—cutting-off the sharp angle above Newburn—and in the formation of proper embankments over the marshes, and the dredging-out a channel of suitable capacity and form for the discharge of the land floods.

I have no doubt but by these works the inclination of the low water surface of the river might be reduced to between 3 and 4 inches per mile up to Lemington and thence to Hedwin Streams to between 4 and 6 inches per mile. This would give a flow at spring tides of 13 feet at Scotswood, and 12 feet at Newburn, the flow at present being from 9 feet to 10 feet at Scotswood, and 4 feet 6 inches to 5 feet at Newburn. As to the low water channel, it is at present so irregular and variable, that it partakes of the character of a mountain torrent rather than a navigable river. This is mainly due to its extremely tortuous course between Scotswood and Newburn, and without straightening it, I think all attempts at improvement would end in disappointment.

To justify this opinion, I need only state that these bends, and the consequent irregularities which they cause in the sectional area of the channel, obstruct the land floods to such a degree that they attain a fall of nearly 17 inches per mile between Hedwin Streams and Newburn—28 inches between Newburn and High Stella—41 inches between High Stella and Blaydon—18 inches between Blaydon and Scotswood—16 inches between Scotswood and King's Meadows—and only $3\frac{1}{2}$ inches per mile from thence to Newcastle bridge.

It will be necessary to make the present weir near the Hedwin Streams an efficient bar to the lowering of the bed of the river above, so as to prevent, as far as possible, the accumulation of gravel in the new channel from that source. Its own bank and bottom will, of course, be maintained by giving it such a sectional area and direction as will carry off the flood-water with a suitable current.

These improvements would divert the river from Dunston, from Lemington, from Blaydon Haugh, from Blaydon, and from Low and High Stella—but the occupiers of all these, as well as of the other business localities, are deeply interested in perfecting the navigation to the greatest possible extent, and, by adjunct works which will be explained, their communication with the river will be beneficially, rather than injuriously, affected.

Second.—The nature and extent of the works required to insure these improvements.

Appendix No. 15.

By a reference to the Plan No. 1 of the works designed, which accompanies this Report, it will be seen that I propose to improve the entrance to the harbour by the construction of a pier over the Herd sand—of another on the Tynemouth rocks—and of two more at the Narrows running east, the one from the Low Lights on the north shore, the other parallel thereto on the south shore, and commencing near the Herd beacon.

The head of the great south pier is placed at the eastern extremity of the Herd sand, in 5 feet water at low water, with the light on Tynemouth Head bearing due N., Freestone Point being N. by W. $\frac{1}{4}$ W., and distant about 1,700 feet, leaving the low water width of the entrance on this line from 1,100 to 1,200 feet. From the head this pier is designed to run W., in the direction of South Shields point, for a distance of 1,200 feet, and then to diverge in a south-westerly course across the Herd sand, until it meets the shore at Spring Gardens. The whole length of this kant is 2,450 feet; 450 feet of the inner or south end being open work on piles.

The north or Tynemouth pier would have its head on the west end of the Sparrow Hawk, as marked on the Admiralty charts of 1849, in 6 feet water at low water, bearing N.N.W. from the south pier head, and distant from it 1,100 feet, which would be the width of the entrance. The general bearing of this pier is W.N.W. for a length of 900 feet, and it is then designed to kant northwards to the land for a length of 420 feet. The first portion of it, namely 900 feet, is to be solid masonry; the kant is to be a wooden piled staging like the inner end of the south pier.

This arrangement of the entrance piers will effect the following objects:—

The south pier head projecting, as it does, east of Freestone Point, and of the north pier head, will catch the flood tide stream as it comes down from the north, and send it into Shields harbour, in a direct course. It will prevent the Wheel and the other cross currents due to the flood tide overrunning the harbour's mouth, and it will shelter the whole of the channel, from the bar to the Narrows, from the south easterly gales.

The north pier is left open at its inner end to prevent the accumulation of sand that might otherwise take place to seaward of it, and so increase the deposits on the bar. It will afford greater shelter to the entrance channel from the north easterly winds, and lessen the amount of broken water immediately within the bar, whilst the combined effects of the two piers will be to confine the whole power of the flood and ebb stream on the bar, thereby increasing the scour, and consequently the depth of water over it.

Of the two inner piers, that at the Low Lights runs eastward along the Middle Scarp for 1,400 feet, and the other runs parallel to it for 1,200 feet along the Herd sand, enclosing between them that part of the river called the Narrows. Their objects are, to aid the outer piers in giving a proper direction to the stream of flood and ebb between Shields harbour and the bar; thereby scouring out the Middle Ground, and part of the Insand, and in effectually stopping the passage up the river of any sea or sand that might enter through the openings in the outer piers or otherwise.

The only other work between the bar and the Narrows is the removal of the Stones. This is not shown on the plan, but is provided for in the estimate.

In Shields harbour, no works are required, but I have shown on the plan, lines, up to which the quays may be built by the owners of the adjoining property. I would add, that, as the present quays require to be rebuilt, they should be regulated by these lines, and the whole constructed in a permanent manner.

I have stated in the first head of this Report, the importance I attach to the removal of Whitehill Point, and the works on both sides of the river from thence to Howdon. In the accomplishment of these objects, the diversion of the deep water channel of the river from the numerous and important coal staiths on the Hayhole shore, presents the greatest difficulty. This I propose to overcome by making the requisite banks for straightening the river course, a dam, furnished with dock gates, by means of which the water would be retained along the whole line of shore between Hayhole Point and Howdon to the level of half tide. In this way great benefit would be conferred on the proprietors of these shipping places, and at the same time the best line for the river would be observed. This arrangement would give a canal of from 200 feet to 250 feet wide along the front of the staiths, having 18 feet depth of water at high water of neap tides—21 feet at high water of spring tides—and never less than 14 feet.

The gates are proposed to be 50 feet wide, recessed from the stream of tide for convenience of entrance, and having their sills laid at such a depth that at high water of the lowest neaps there should be 15 feet 6 inches of water over them.

I have designed the details of the dock in the most inexpensive way, having regard to efficiency for its purpose, considering that its cost should, in justice to all parties, be as little as possible beyond that of lengthening the several staiths to the new line of river; and in the expectation that as the advantages it offers over open tidal staiths are very great, the parties benefited would be induced to contribute the difference of cost, or submit to a small toll to cover it.

By making it a half-tide dock, the loss of back-water will be trifling, whilst it will be advantageous to vessels resorting to it by being accessible for six hours each tide. I should add, that I have provided in the details of the plan for the nature of the ground on which the dam would have to be founded.

Further, it will be seen that I propose to cut off 100 yards from Whitehill Point, and 60 yards from Hayhole Point—to excavate and dredge the clayey foreshore to a depth of

Appendix No. 15.

5 feet below low water—and to form a half tide bank from Whitehill Point over the Dortwick sand to near the north shore of Coble Dean.

On the Jarrow Stake shore, I have laid down a stone embankment, which commences on the north side of the channel of the river Don, opposite the High Factory Chemical Works, passes thence in a direct line to within 200 feet of Young's new High Ship Yard; and sweeping round with a sharp curve, assumes a line almost parallel to the opposite works as far as Jarrow Quay Point, where it terminates.

The height and general arrangement of this bank are such, that whilst, in connexion with the works of the opposite shore before described, it effectually directs the strength of the flood-tide up the new channel of the river, it also prevents any injurious accumulations or shoals along the front of the ship yards and higher part of the South Shields shore, by causing a large portion of ebb-tide from Jarrow Slake to pass off by the channel of the Don, and its new outfall at Young's yard.

In determining the proper width for this part of the river, much care has been required, as it fixes the breadth for every part above. After due consideration of all the questions involved, I have decided that it should be 1,000 feet at Whitehill Point, diminishing upwards in the ratio of the decrease in the tidal water to be passed, so as to obtain, as far as practicable, an uniform current during the first half of the flood and last half of the ebb—at the same time affording the requisite space for the convenient working of shipping.

In considering the kind of works best suited for the training of the river above Howdon, it was necessary to determine the relative advantages of groynes and parallel banks—also what should be their height with reference to high water. On going carefully into the question of the requisite quantity of backwater to scour and maintain the proper depth of water at the bar and the lower reaches of the river, it became apparent that the works which would least interfere with the capacity of the river as a tidal receptacle, should be adopted; and that, as far as Bill Point, all the training should be effected by half tide banks. It also appeared that such banks, made with openings at suitable intervals, would form a less obstruction to the adjoining shores than groynes. That this is the case, I established by levels taken in front of every wharf on each side of the river, which show that, with very few exceptions, banks of the kind proposed will not injuriously affect the wharves and other premises. The principal exceptions are several of the coal staiths—the quays of the Walker Iron Works, and St. Anthony's Lead Works. These must be extended to the new river channel, and I have provided accordingly in the estimates.

Of course, there will be an increased tendency to deposits between the shore and the half tide banks, but this will be slow in comparison with that which groynes would occasion, seeing that the latter would stop all current between the shore and their heads, whilst, with half-tide banks, having openings as proposed, there would be a strong shore current from half-tide of flood to half-tide of ebb, and the stream through the openings would, as the impounded water passed off, tend to keep them clear to a convenient depth for access to the shore.

The openings would, of course, be furnished with proper beacons for marking the sailing channel of the river, as well as the places of deep water access to the shores.

The plan shows that I propose the training bank on the north shore to follow the course of the new quays at Willington and Low Walker. From thence it follows in a straight line to Bill Point. On the opposite or south shore the bank is drawn in almost a straight course from Jarrow Quay to the head of the Hebburn Coal Staith—from thence in a gentle curve, corresponding with the north bank, to opposite the south end of Hebburn Quay—and from thence in a straight line to Pelaw Main Staith.

The breadth of the channel is diminished from 1,000 feet at Whitehill Point to 825 feet at Jarrow, and to 510 feet at Pelaw Main Staith.

Between Bill Point and Newcastle bridge, the following works occur:—On the north shore, the excavation of the rocks at Bill Point to a depth of 5 feet below low water—a half-tide bank between this point and the west boundary of St Anthony's Alkali Works—a wharf wall round St. Anthony's point—a half-tide bank from thence to Hoyle, Robson, & Co.'s Coke Ovens—a wharf wall across Dent's Hole in continuance of the wall of St. Peter's Dockyard— several small patches of quay wall thence to Ouseburn—and, lastly, from Ouseburn a new wharf wall in continuation of the town quays.

On the south shore the works are, a wall from near Pelaw Main Staith to the iron works at Snowdon's Hole—the excavation of the point at Ewehole—the removal of the projecting land at the Brandling Main Staiths, and the construction of a retaining wall along the same—the removal of about 100 feet of Friar's Goose Point, and the erection of a wall round it—the formation of a half-tide bank from Friar's Goose to Allhusen's Alkali Works—and, lastly, the erection of a wall from the chain cable works to a spot near the Woolwich Iron works.

It is not possible to determine with any precision what may be the amount of excavation and dredging necessary below low water, but in making out the bill of works for the estimates, I have made a liberal allowance to meet such uncertainty so far as the excavations are concerned; and, in respect of the dredging, I propose to provide in the estimates for the maintenance of two powerful dredging vessels, and the requisite establishment of barges and steam tugs.

Above Newcastle town quay (see Plan No. 2) the first work that occurs is the new bridge. This should give a clear waterway of 450 feet. In the middle of the river—that is opposite the centre pier of the High Level bridge—there should, as before stated, be a pier, with a 45 feet opening on each side, spanned by a double swivel bridge of wrought iron, and on each side of this swivel bridge, three openings of 60 feet each. The best site will be immediately below the present bridge which should stand until the new one is completed. The roadway should be on the same level as the streets on each side. A wrought iron girder bridge will therefore be the most suitable. Appendix No. 15.

From the bridge to King's Meadows the works will be half-tide banks, as shown on the plan—the widening of the north channel at King's Meadows, and the diversion into it of the whole stream by a bank made across the south channel at the head of these meadows, and the training of the outfall of the river Team into the new channel, so as to open a navigable canal up to the Dunston shore.

Between King's Meadows and Scotswood, training banks on each side will be required, and the owners of the property may be permitted to built barrier banks on the lines laid down, for the purpose of keeping the flood water from the marshes.

Between Scotswood and the sharp bend above High Stella, the works comprise a new cut for the river, with flood or barrier banks on each side. To remove all objection to this diversion of the river, I propose to convert the old channel into two docks, each having a suitable entrance lock from the new river course.

The advantages of this arrangement to all the factories and staiths in the neighbourhood will be obvious, and will doubtless secure the aid of the owners in carrying it out.

From the head of the new cut to Newburn, the only works required are banks for training the river. As below Scotswood, barrier banks might be permitted, if built on the lines laid down.

Above Newburn, the projecting point on the opposite shore should be cut off, and the river trained up to the weir near Hedwin streams.

The weir itself should be rebuilt in a substantial manner, so as to hold up the bed of the river above.

Finally, I would observe, that I do not think it expedient to scour out the new channel except where it happens to be in sand. Where the soil to be removed is gravel or clay, it should be excavated or dredged, and removed above high water, unless it would be advantageous to deposit it behind the training banks.

Third.—The order in which the works should be executed.

The whole of the works between the bar and Bill Point are so necessary to any very considerable improvement in the navigation, that they should be regarded as the first section to be executed. All the works comprised in it should be begun at such times that they might be completed simultaneously within four or five years from the commencement of operations. To accomplish this, the first work set in hand should be the south pier. When this is sufficiently advanced, the north pier should be commenced. As soon as it is raised above the level of high water, the two remaining piers at the Narrows, and the works between Whitehill and Bill Points, should be pressed forward, so as to be ready by the time the north and south piers are finished.

Until the entrance piers, the training banks, the removal of Whitehill, Hayhole, and Bill Points, and the other shore works are completed, it would not be prudent to undertake any dredging beyond what might be necessary for incidental purposes.

The order of the works between Bill Point and Newcastle bridge should be as follows, and would comprise the second section :—the removal of Friars' Goose point—of Ewehole—of Brandling Main Staiths points—and the erection of the required wharf walling from Pelaw Main Staith to the Iron Works at Ewehole—the quay in front of St. Anthony's Lead Works, with the half-tide bank immediately above the same—the half-tide bank from Friars' Goose Point to the Alkali Works above Tyne Main Staiths, with the quay wall at Dent's Hole—the widening of the north shore quay—and lastly, the erection of the several pieces of wharf wall for regulating both shores of the river as marked on the plan.

The works above Newcastle Town Quay would form the third section.

The first of these to be undertaken is the new bridge. When this is completed, and the old bridge removed, the works for training the river from thence to Scotswood should be performed. The new cut from Scotswood to beyond High Stella should then be opened, and the several portions of the old channel converted into docks. After this is done, the point above Newbury should be cut off, and the training banks from the end of the new cut to Ryton weir should be formed. The weir itself should then be rebuilt; and finally, such dredging or excavation as may be required to bring the new channel from the weir to the mouth of the river to the proper sectional area, must be commenced and executed as rapidly as possible.

As already remarked, I have treated as parts of the general works the lengthening of all staiths that would be cut off by the new shore line, as also the few wharves that might be damaged by it. It will, however, I presume, be a subject for arrangement in all cases where the improvements increase the area of wharves, or bestow other commercial advantages on the frontages, to what extent they should contribute to the cost of the works by which they benefit.

Appendix No. 15.

Fourth.—As to the cost of the works required for the improvements. Taking them in sections as above, we have in

SECTION, No. 1.

	£	£
The north and south entrance piers to cost	95,000	
The two piers at the Narrows	30,000	
The removal of the Stones	5,500	
The half-tide bank across Dortwick Sand, the removal of Hayhole and Whitehill Points, and reconstruction of staiths at the latter, the excavations in front of these points, the half-tide dock at Hayhole, and Jarrow Slake stone-embankment	136,000	
The half-tide bank from Howden to Bill Point, and the necessary additions to several coal-staiths, the new quay at Walker Iron Works, the excavations at Bill Point, half-tide bank from Jarrow Quay to Pelaw Main Staith, together with the necessary lengthening of several staiths and shortening of others	46,000	
	312,500	
Contingencies, &c., 15 per cent.	46,875	
Total cost of first section, exclusive of land and of the dredging of the channel		359,375

SECTION, No. 2.

The removal of Friars' Goose Point, of Ewehole Point, of Brandling Main Staith Point; the wharfwall from Pelaw Main Staiths to the Iron Works at Snowdon's Hole; the quay in front of St. Anthony's Lead Works; the half-tide bank above the same; the half-tide bank from Friars' Goose Point to the Alkali Works above Tyne Main Staiths; quay at Dent's Hole; the widening of the north shore quay; wharf-walling in places up to the old bridge; and alteration of coal-staiths, &c., where required:—in all	63,000	
Contingencies for the works in this part of the river, 10 per cent.	6,300	
Total cost of the Second Section, exclusive of land and buildings, and dredging		69,300

To complete the estimate for the improvements of the river below Newcastle Bridge, I have thought it best to put the cost of the dredging required, in this portion of the channel, after the estimates of the two first sections.

The cost of two dredging vessels, which must be of 30-horse power each, with the necessary barges, steam tugs, and apparatus for working the same, less their value at the end of three years from their commencing work	10,000	
Cost of maintaining them, and of the establishment necessary to work them for three years, at £5,000 per annum.	15,000	
Total cost of dredging		25,000
Making the total cost of the improvements below Newcastle bridge, exclusive of land and buildings required		453,675

SECTION, No. 3.

The first work is the new bridge, which, with the removal of the old bridge, will cost	35,000	
The new cut from Scotswood to High Stella; the conversion of the old channel into two docks; the removal of point above Newburn; the training banks from the end of the new cut to Ryton weir, and the reconstruction of the weir itself	60,000	
	95,000	
Contingencies, &c., 10 per cent.	9,500	
Total, exclusive of land	104,500	
The dredging of this part of the river forms the remaining portion of the last section. It will be executed by the same dredgers as the other part, (and, allowing for deterioration in the value of the machinery), will cost	12,000	
		116,500
Making the entire cost of the improvements from Ryton weir to the sea		£570,175

Not having understood, till very recently, that you required me to prepare plans and estimates for the improvement of the river above Newcastle town quay, it has not been in my power to go into the details of the necessary works with the same care that I have exercised in the case of those below bridge. The sum, however, put down for those works, will, I doubt not, be found, on fuller investigation, a close approximation to the truth.

Desirable as these works are, it would not, I think, be prudent to undertake them until the whole of those required below Newcastle are completed, and the revenue become such as to secure you from financial embarrassment. Appendix No. 15.

In conclusion, I have to express my regret that this Report should not have been in your hands earlier. Many concurring circumstances have caused the delay; of some of these you are aware, and will make full allowance for; others you will be able to appreciate by an examination of the accompanying appendix.

I trust that there is still ample time for your due consideration of the proposed plans, and for application to Parliament, next session, for the requisite powers to carry them into effect.

Numerous and important as are the interests that will be affected by the proposed works, it is not, I should hope, to be doubted but that all will unite in an equitable mode of raising the requisite funds; for whatever may be the opinions formed of the particular plans now before you, I am quite sure that all will allow that works of the same description are necessary to the maintenance of the commercial supremacy of the Tyne—a river, the banks of which for eighteen miles are covered with establishments employing a vast amount of capital, and which teem with a population unsurpassed for manufacturing enterprise and skill, whose prosperity is entirely dependent on the efficiency of its navigation.

I have, &c.
JAMES M. RENDEL.

No. 16. Appendix No. 16.

MR. RENDEL'S REPORT on the HAY HOLE DOCK, and ENTRANCE PIERS, River TYNE.

TYNE IMPROVEMENT.

8, Great George-street, Westminster,
November 4, 1851.

MY DEAR SIR,

As intimated in your letter of the 31st ult., Mr. Brooks was with me yesterday, and explained his proposed alterations in my design for the following works, namely—the entrance piers, the Howdon docks, and the excavation of Hay Hole point.

Since that explanation was given, I have duly weighed all the arguments he adduced in support of his views, and the result is a firm conviction that it would be inconsistent with the economy of the river to adopt any of the alterations he proposes.

First.—As to his alteration of the entrance piers, his plan would defeat one of the great objects it was my study to effect, namely, the early set of the flood tide up the harbour; his north pier would dispose the sands brought down by the flood tides to deposit themselves in front of his entrance, and the cost of building such piers as he proposes, namely, in 20 to 23 feet for the north pier, and in 19 to 20 feet for the south pier, at low water, would, if the piers were built with the necessary regard to permanence, involve an outlay inconsistent with the means of the Commission.

Secondly.—As to Howdon dock, his plan assumes that the line of the boundary between the river and the dock might be curved, which is opposed to the principle that I have laid down, namely, that it is all important to preserve a straight run for the stream of flood and ebb tide in this part of the river, when there must always be a strong tendency in the river to form banks, and when under the most favourable circumstances the greatest expense will have to be incurred in dredging, if the channel of the river is to be maintained in an efficient state. Again, Mr. Brooks' proposal to make entrance basins and complicated locks for this dock, seems to be involving an outlay inconsistent with the objects of the river improvement, and I very much doubt whether it would be practicable, having regard to cost, to make a whole tide dock in the manner he proposes, and indeed if such dock could be made, it would not, I consider, offer any advantages for the coal trade over the more simple and economical plan of a half tide dock, as laid down by me; nor am I prepared to say that it would be prudent for the Commissioners to suffer such an abstraction of water (tidal) from the river as the conversion of the proposed dock into a whole tide dock, would occasion, and

Thirdly.—As to the excavation at Hay Hole point, I consider it important and I am not prepared to acquiesce in his arrangement for avoiding it, in order to obtain works of a kind which I am confident the coal trade cannot afford to pay for, and which, if made at that particular part of the river, could not be maintained at the requisite depth for the entrances. The arguments advanced by him as to the saving of expense consequent on bringing out the western end of the Hay Hole dock, so as to avoid the half-tide bank opposite to Jarrow Quay, do not, I think, deserve so much importance as he attaches to them, for all the staiths and shipping places on that part of the shore might be brought out to the line of the half tide bank, at the estimates I have furnished, which do not amount to one third of the additional cost that would be involved by the proposed alteration in the line of the Hay Hole dock embankment; but, as I said before, I object most strongly to the bends which Mr. Brooks' plan would occasion in this part of the river, and I am quite sure that it would lead to the formation of banks and the consequent inconvenience to the Jarrow quays, which Mr. Brooks seems so anxious to preserve.

It will at all times give me pleasure to afford the Commissioners every information in my power as to my reasons for designing the works of improvements in the manner laid

Appendix No. 16.

down in my plan, but I wish it to be distinctly understood, that before committing myself to them, I took infinite pains to inform myself of all the circumstances material to the question, and unless Mr. Brooks, or other persons, have new facts to bring to my notice, I really see no advantage in referring back to me questions which I have already thoroughly considered, and definitely settled in my mind.

It is, I feel, only further adding to the expense of an inquiry, which has already been great, and distracting the attention of the Commissioners from that course of action upon which it is now high time they should enter.

I am, &c.

John Clayton, Esq.,
Newcastle-on-Tyne.

(Signed) J. M. Rendel.

Appendix No. 17.

No. 17.

River Tyne Improvement.—Piers at Entrance.

The Report of James Walker, Esq., LL.D., F.R.S.L. & E., &c., addressed to the Tyne Improvement Commissioners, dated 15th November 1853.

Introduction.

Sirs,—As the subject of this Report (the piers for the entrance of the River Tyne) is one of general interest and of great public importance, it may be proper to preface my observations by stating, for the information of others not so well acquainted with the details as the Lords Commissioners of the Admiralty and the Tyne Improvement Commissioners, my own position and the course of my proceedings.

The matter under consideration first came before me in the character of Admiralty Inspector, under the Preliminary Inquiries Act, when a Bill for these works was pending in Parliament, which Bill passed in the year 1852.

Appointment.

A difference of opinion having been found to exist between the Admiralty and the Tyne Improvement Commissioners—or perhaps I should say, between the professional advisers of the two bodies and others—as to the plan within the limits of deviation proper to be adopted, a letter from Mr. Clayton, the officer of the Tyne Improvement Commissioners, of the 18th April last, addressed to the Secretary of the Admiralty, suggests "that if their Lordships would approve of the plan being submitted to "Mr. Walker, there would be a probability that the Commissioners would feel themselves "justified in acquiescing in any alteration in the plan he might decide upon."

The reply of the Secretary to the Admiralty, dated 6th May 1853, states "that their "Lordships have long felt the necessity of placing the entire responsibility of the plans "for the works at the entrance of the Tyne with an eminent engineer, in whom their "Lordships, the Tyne Commissioners, and the public, might place confidence; and that "if the proposal made by the Commissioners be acceded to, it should be understood that "the plans of works, when completed by Mr. Walker upon his individual responsibility "(after taking all necessary evidence), should be final and accepted by the River Tyne "Commissioners, and not to be deviated from, unless with the concurrence of the Admi-"ralty; and that Mr. Walker be left entirely unfettered, within the limits of deviation "of the Act of last year, to select or modify any proposed plan, or to originate any other "plan, as he might deem proper, to cover his responsibility in so grave a question." The letter adds, "that in the instructions to be given to Mr. Walker, he should be called upon "to provide for the removal of the 9-feet bar by means of dredging, to the depth of 14 "feet at low water spring tides, as a work which their Lordships insist on being "executed."

In answer to the above, Mr. Clayton, on the 14th June, stated to the Lords of the Admiralty "that he was authorized by the Tyne Improvement Commissioners to accept "the appointment of Mr. Walker in the terms of their Lordships' letter, and that the "Commissioners would readily take such steps as he might direct for the removal of the 9-feet bar.

The next letter is from the Secretary to the Admiralty, dated the 16th June, and acquaints the Tyne Improvement Commissioners "that Mr. Walker had been informed "that their Lordships require he should receive on the part of the Admiralty the evidence "of Captain Washington, R.N., Mr. Calver, R.N., and Captain Vetch, R.E., on the matters "to be dealt with, and such other evidence as the Tyne Improvement Commissioners "might propose, or Mr. Walker might judge necessary as preliminary to designing the "work, which he is to be left entirely unfettered to adopt."

My instructions from the Admiralty are in substance precisely the same as those contained in the above correspondence, and therefore I need not repeat them.

Proceedings and evidence, 1852.

So soon as I had received the above instructions in an official communication, dated the 8th July, with a copy of the above-quoted Admiralty correspondence, I immediately referred to and examined the evidence which, as "Inspector for the Admiralty," under the Preliminary Inquiries Act, I had taken at Newcastle and in London in the months of March and April 1852, when the Bill for the Improvement of the Tyne by the erection of piers at its mouth and otherwise was before the House of Commons. Mr. Clayton attended on that occasion as solicitor for the Bill, and Mr. Leitch, the Town Clerk of Tynemouth, for the parties opposing it. The witnesses examined were—Mr. Wake, Harbour Master; Mr. Brooks, engineer; Mr. Thomas John Taylor, mineral agent; Mr. Calver, R.N.; Mr. Charles Carr, engineer; Mr. Nicholson, engineer; Mr. Gibson,

who bored the ground; Captain Purdo, R.N.; Mr. Shotton, shipowner; Mr. Straker and Mr. Popplewell, Tyne Improvement Commissioners, and Mr. Barker, shipowner. Mr. Rendel, the engineer, was also examined to some extent; and although the inquiry included docks and other matters as well as piers, all the witnesses who had considered the latter gave their opinions respecting them; and the subject has since had my almost constant attention from the middle of July to the present time, both in the surveys I have made with reference to it, and in the examination of surveys and evidence from 1813 (the date of a very detailed and valuable survey and observations made by Mr. Giles and Mr. Comrie, for the late Mr. Rennie) down to the late surveys in 1849 by Mr. Calver, for the Admiralty, and by Mr. Comrie again for Mr. Rendel, the engineer employed by the Commissioners.

Proceedings and evidence, 1853.

The examination of witnesses in London, Tynemouth, and Newcastle, extended, with intermissions, from the 19th July to the 19th August. My junior partner, Mr. Cooper, who is well qualified to assist me, attended these examinations. In addition to Captains Washington and Vetch and Mr. Calver (the three gentlemen specially named by the Admiralty), there were present Mr. Wake, Harbour Master; Mr. Brooks, engineer; also, Messrs. Harrison, Purvis, Young, and Oates, pilots; Messrs. Robinson, Stevenson, Lourie, and Straker, Tyne Improvement Commissioners; Mr. Robert Anderson, shipowner of South Shields; Mr. Raine, a Member of the Trinity House; Mr. Danson, Harbour Master of Newcastle; Mr. Thomas John Taylor (who in 1851 published his opinions on the subject of the harbour and piers); Mr. Thomas Smith, the extensive shipowner and shipbuilder; Mr. Holt, Superintendent of Submarine Works; Mr. Comrie, surveyor; and Captain Linskill, who produced a copy of a design for docks and piers, which he stated to have been proposed by Mr. Brooks, in 1848. Captain Linskill's evidence was taken by me in London on the 19th August. He then informed me that the South Shields and Tynemouth authorities did not consider that they had sufficient notice of my visit to enable them to attend the Tynemouth meeting with their evidence. My reply was that all my correspondence had been with Mr. Clayton, as the officer of the Commissioners, and that I had depended upon him for informing others of the time of my visit and for giving due notice of it. This gave rise to a correspondence with Mr. Leitch; and in the end, as I thought that to close the inquiry without giving a further opportunity for receiving evidence, even if no fresh information should be produced, would have the effect of leaving open a door for objections, I gave notice to T. C. Leitch, Esq., Town Clerk, Tynemouth; C. H. Greenlaw, Esq., Secretary to the Shipowners' Society, North Shields; Thomas Salmon, Esq., Town Clerk, South Shields; G. Potts, Esq., Secretary to the Shipowners' Society, South Shields, and to the Tyne Improvement Commissioners—that I should attend again at Tynemouth, on the 28th September.

On this last occasion I was met by Mr. Clayton, for the Tyne Improvement Commissioners; Mr. Leitch; Messrs. Barker, Shotton, Straker, and Greenhow, for the Tynemouth (North Shields) Shipowners' Society; Mr. Alderman Bartleman, Mr. Procter, Mr. Carr, and others, for the North Shields Committee of Trade; and Mr. Stainton, Mr. Thompson, Mr. Salmon (Town Clerk), and others, for the Corporation of South Shields. The witnesses called by the above gentlemen were Mr. Brooks, Mr. Stevenson, Mr. Barker, Mr. Wake, Mr. Shotton, Mr. Greenhow, Captain Purdo, Mr. Hutcheson (pilot), and Mr. Hall (steam tug proprietor).

Thus I hope that, so far at least as regards the receiving evidence and collecting opinions, I have done justice to the subject. I may add, that I do not remember the case of a harbour to the improvement of which so much attention has been paid on all sides, in the way of designing and reporting, from 1813, the date of Mr. Rennie's plan, up to the present time. This is a proof of the importance of the subject, of the interest taken in it, and I may say also of its difficulty, when I refer to the variety of the designs that have been made by eminent and experienced men. These have been kindly produced to me, and I have also been informed by the authors of the grounds on which their designs have been recommended.

Various designs.

Designs.

It would be extremely difficult, if not impossible, to describe the different plans in words, so as to give any correct idea of them, or to state exactly in what respect each differs from the others. At the same time, I am desirous to do justice to their authors, and have, for the better enabling me to consider their various features, had the whole drawn out to the same scale, a copy of which, and also of my notes containing the substance of the evidence taken by me, can be sent to you if you desire it. The designs referred to are those of the late Mr. Rennie, Mr. Rendel, Mr. Brooks, Captain Washington, R.N., Captain Vetch, R.E., Captain Purdo, Mr. Calver, R.N., Mr. Thomas John Taylor, and Mr. Henry Turner.

Each of the designs has its merits; but for me to enter into a detailed criticism of the peculiarities of each would be a laborious task, attended with little, if any, practical good. My duty has been to consider them all, and to endeavour to make from them and from my own and Mr. Cooper's observations, and from the evidence, such a design as should remove the present evils and dangers at the entrance, and produce at the same time as little as possible of countervailing evil. I am fully aware of the heavy responsibility of the task which I have undertaken, and have done my best to fulfil it.

The bar.

The present great evil, to the removal of which all the designs (including the design which I am about to recommend) have been directed, is the bar. This has been generally proposed to be effected by confining the ebbing water of the river and harbour, and

Appendix No. 17.

directing it upon the bar at the entrance, instead of allowing it to escape over the Sparrow Hawk and other sands. But the difficult question to solve is, can this increase of velocity and depth through the narrowed space between the piers be contrived so as not to have the effect of causing a similar deposit outside the piers, and thus forming a bar there?

It is, in my opinion, clear, that if the outgoing current and the passing (south to north) ebbing tide were in the same direction and of the same velocity as at present, and if the same quantity of sand were still to be admitted by the flood tide into the harbour and river by the Wheel, and afterwards to be passed out during the ebb tide, the same causes would produce the same effect as they do at present—viz., a bar, but outside the present one. For the position of the bar is by no means fixed; it is at the point where the opposing forces, west to east, and south to north, meet or balance, and it would be moved out beyond the piers if this balancing point were moved out by increasing the current between them.

Reasons for less bar.

My expectation, however, is that all these conspiring causes of a bar would be modified, and the effect of them, to say the least, very much diminished, by the adoption of the design hereafter described; for the following reasons, viz.:—

That all the outgoing water, being confined by piers instead of spreading over so wide a space as at present, would, at the ends of the piers, join the coast tide passing from south to north, with increased velocity or energy.

That the sand would be brought out to where there is deeper water, and therefore the same quantity deposited would not produce a bar of the same height as at present.

That the south to north ebbing tide, to which the piers would be extended, may be expected to be stronger when confined or collected, in passing the ends of the projecting piers, and thus to check the formation of a bar.

That the operation of a south pier, even if but a short one, which Captain Washington and other naval gentlemen think likely to be sufficient, would stop a large portion of the sand that is now carried into the harbour during the flood tide by the Wheel, so that there would be less sand to go out again on the ebb.

Nine-feet bar.

I think also that the artificial straightening and regulating of the channel at the "Stones," called in my instructions "the 9-feet bar," for the removal of which the Lords of the Admiralty make a positive stipulation, and to which you have assented, will have a beneficial tendency both above and below it. Therefore I strongly recommend that this be set about seriously and without delay, not only as a compliance with the agreement made with the Admiralty, but on account of the effect to be expected from it. This would be done by the usual process of dredging, aided by diving, to raise loose boulders, or by blasting, if the material to be removed is solid rock.

Bar and Sparrow Hawk sands.

The general observation of a sympathy between the bar and the Sparrow Hawk has been considered as a proof of the effect which confining the water between the piers would have. It is remarked that at present, when the bar is low (good) the Sparrow Hawk is high, from which it would appear that the two facts are connected; but the Sparrow Hawk being high is, I think, rather the effect of the good bar than the cause of it. The sand that forms the bar is deepened by the scour of the river, chiefly during land freshes with westerly winds; and when so deepened, there is, after the freshes have gone off, a greater channel for the ebbing water to escape in the straight line, and therefore a comparatively less quantity and velocity upon the site of the Sparrow Hawk;—thus allowing a deposit upon it, and a rising of its surface. There is also, in times of these freshes which lower the bar, less room in the river for tidal water to enter; and then all the sands, both the Sparrow Hawk and the Herd, over which the flowing and ebbing tide passes, have a tendency to rise. When there is no fresh, or when the action of a fresh is checked by easterly winds, these causes cease to operate, the sand or bar in the straight channel begins to rise, and a larger portion of the ebbing water is diverted over the Sparrow Hawk, so as to deepen it.

On one point there was a unanimity of opinion among all parties—that to confine the outgoing current over what is now the bar, must, by increasing the velocity, deepen the channel.

Reasons for present design.

In the position and direction of the piers which I have designed, I have been influenced by various considerations, besides that of the removal of the bar. The following are the principal, viz.:—

1. To give heavy seas space to spread and spend themselves immediately after passing the piers; so that vessels, having got inside the piers, may be in quieter water; in a kind of outer harbour.

2. Not to lessen materially the extent or area of sloping sand, which is useful, not only for the above purpose, but also for vessels beaching upon it, in case of their being obliged to do so. Towards these objects I consider the particular form and depth of Prior's haven to be favourable; and therefore I propose the north pier to start from the northern side of the haven, so as to include it in the harbour. This will also be better, as regards the use made of Prior's haven by the inhabitants, than starting from the Spanish battery, which would leave the haven outside.

3. To enable vessels entering with scant northerly or southerly winds to haul up close under either the north or south pier, and so to escape getting upon a lee shore, and (owing to the proposed height of the piers) to be sheltered from the violence of the winds: this they would be as soon as they should get inside or round the Heads, and would thus escape the dangers of the Herd sand and the Black Midden rocks. From

the action of the north to south current of flood tide being upon their broadsides, vessels are at present liable to be driven upon the Herd sand, particularly when, from the want of depth of water upon the bar, they are but little under command of the helm. But with the piers as proposed, even if vessels were to get ashore, it would be in smoother water, and the danger to ships and crews would be much less than at the present time, when they are quite exposed.

4. To give to laden outward-bound ships shelter from the worst winds until they clear the pier heads, and get into deeper water; and

5. To enable tug boats to get further out to assist ships in entering or leaving the harbour.

Several of these advantages would be obtained from the north pier only, and therefore I consider the north pier as the more important, and the one which ought to be proceeded with at once; but I do not think that the cure of the present evils will be complete without the south pier also. I have named the use of some south pier as a preventive to the Wheel, which not only carries sand into the harbour, but prevents the fair run of the tide between the bar and the narrows. In this I think nearly all the witnesses agree; but there is great difference of opinion as to the extent proper for the south pier. The result of my consideration, which is also in conformity with the majority of the opinions I have received, is, that the south pier should be carried out so far as to protect the entrance from southerly storms, and thus to lessen the danger of vessels being driven upon the rocks (viz., the Black Middens, Freestone points, &c.) on the north side, which are naturally of a more dangerous character than the Herd sand, on the south. In one respect, indeed, it may be argued, and with some show of reason, that the north pier alone would rather increase the difficulty of vessels entering, by throwing off the flood tide, the tendency of which at present is to counteract the force of southerly winds upon vessels until they get inside the rocks that are off the Spanish battery; but although the north pier will throw off the current and change its direction, the Wheel or eddy tide into the harbour will continue until it be shut off by a south pier of such a length as to confine the flood current entering the harbour to the width between the piers; and as this width is proposed to be only such as is required for the purpose of an entrance, the water flowing inwards being through a channel of considerable depth, will not be likely to carry so much sand in with it. This would not be the case with a much shorter south pier, or with a wider entrance; but, as was remarked by some of the witnesses, there will be, during the execution of the works, the opportunity for the Commissioners to feel their way, observing effects as the south pier proceeds, and regulating the extent of this pier accordingly.

North and south piers.

I consider the quantity and velocity of the ebbing stream to be such as, with the removal of the "Stones," to secure a nearly straight channel in the comparatively short distance between the Narrows and the pier heads; but if side training should be required for removing any deviation from a proper channel course, this can easily be done at low water, and without exposing vessels to damage, should they come in contact and rub upon it.

Channel between Narrows and pier heads.

As to any interruption that the piers may offer to the full flow of tide into the harbour, I would only observe, that the flood current just outside the bar is at present little more than one mile per hour, and that the width between the piers is proposed to be 1,100 feet; while the total width of Shields harbour opposite to the new quay is only 920 feet, and at the Narrows still less.

Interfering with tidal flow.

Taking these considerations together, I do not think that the tendency which any construction would naturally have to throw off the flood tide would amount to a practical obstruction, but rather, that the width of entrance which I have proposed may be found to admit the heavy seas too freely, and that experience may show a further contraction to be desirable. The objects to be attained on the one hand are the removal of the bar, and shelter from heavy seas, and to make the width between the piers such as to accomplish these ends, without, on the other hand, excluding the flood tide, or increasing materially the velocity of the ebb during freshes, and so as not to interfere injuriously with the entrance of ships. If these objects are opposed to each other, absolute perfection in all of them is not to be expected; but such an arrangement should be attempted as may effect the more important purposes, without producing a conflicting evil to an extent that may prove equally injurious.

A reference to the accompanying plan and sections will be more explanatory than any written description.

Description of plan.

It is proposed that the north pier shall start from the rocks under Tynemouth Castle. To have gone still further north, as to Light House point, would be attended with advantages, but would be considerably beyond the limit of deviation; the work would be longer, and in deeper water; and its construction would therefore be attended with greater expense. The general direction is nearly south-east; the length, 700 yards. The foundation, up to near low water, and the core or hearting, except at the head, will be deposited from barges or waggons; and the facing from low water upwards will be paved or walled, at such slope or angle from the perpendicular as the material will admit. The accompanying sections show walls nearly upright above low water. The extreme height or parapet of this pier is shown by the section to be 24 feet above high water. Below this is an esplanade, 12 feet wide, which may be so made as to afford shelter, in recesses underneath it, from the spray in storms; and 10 feet under the esplanade a quay, 18 feet wide and 10 feet above high water. These are the supposed average dimensions.

North pier.

The south pier is proposed to start from the shore opposite to the workhouse, as in the parliamentary plan, and to take an E.N.E. direction; the length, as shown by the

South pier.

Appendix No. 17.

plan, being 1,400 yards. It is intended to be of somewhat similar construction to the north pier, but on the average of less width and height, decreasing gradually from the head towards the shore.

Materials.

Both piers are supposed to be of stone; the hearting being of rubble of all sizes, the facing, of large stone, laid in concrete or cement or mortar, where these can be used with effect. For the heads, copings, and other principal facings, well squared durable stone will be necessary. Mr. Brooks expects that a great proportion of the whole quantity of stone required will be supplied from Trow point, which fronts the sea at about a milesouth of the Tyne, and also from the lands west of Sharpness point; and so far as our (Mr. Cooper's and my own) inspection of the rocks enabled us to judge of the quality of the stone, we think this, particularly as respects the south side, to be probable; but that for the facing of the walls and of the foreshores a still harder stone will be required. A railway may be laid along the shore quite to the south pier; and the stone may also be boated across to the north pier, should the quality of the intended north quarries be found inferior, which there is some reason to expect.

Lights.

A light is supposed to be shown at each pier-head, which will be very valuable guides to the entrance.

Comparison of plan with former plans.

I have stated the principal reasons for the plan submitted by me, and I do not see that the same objects could be effected by any other very different design. It varies in some respects from all the designs, but perhaps corresponds more nearly with the parliamentary plan of 1852 than any other. You, with Mr. Brooks as your professional assistant, appear to have profited by the observations and suggestions of others, and to have modified and improved upon former designs, as may be seen by reference to Mr. Brooks' plans of 1832, 1845, 1848, and 1851, and the others before referred to. The north pier of the parliamentary plan was projected to start from the Spanish battery. In this respect, as well as in the shape and direction of the outer portion of both piers, and in the width of entrance, the principal differences exist. Indeed, in principle and substance the accompanying plan and report may be considered as containing an abstract of parts of the designs or evidence of most of the scientific and practical witnesses; but all these gentlemen must pardon my saying, that the causes of some of the local complaints, for which they prescribe local remedies, will be removed by the operation of the outer piers; so that at any rate the execution of inner works had better be postponed until the effect of the outer works be tested. This observation applies particularly to the inner piers, which

Inner works.

form a feature in Mr. Rendel's plan, and on which a good deal of evidence was given. To protect the cliff under the old barracks from being washed by heavy seas and the materials of it from being carried into the Harbour, would be an undoubted advantage. This object would be more effectually and more cheaply accomplished by a wall under the cliff, than by a pier or wall at the edge of the navigable channel; but there will be ample time for considering and determining on this also when the external south pier shall be built, for a portion of its length, out from the shore.

I am, &c.

(Signed) JAMES WALKER.

Appendix No. 18.

No. 18.

STATEMENT of QUANTITY of MATERIAL dredged out of the River Tyne, and of the cost of such Dredging from 1st September 1842.

	Quantity of Tons raised.	Cost of Dredging.		
		£	s.	d.
For the year ending 31st August 1843	14,300	984	16	11
,, ,, ,, 1844	19,434	735	2	9
,, ,, ,, 1845	57,743	1,677	6	5
,, ,, ,, 1846	34,286	2,297	11	8
,, ,, ,, 1847	50,619	1,875	13	11
,, ,, ,, 1848	49,182	2,034	16	1
,, ,, ,, 1849	70,583	2,645	17	8
,, ,, ,, 1850	75,170	3,423	2	11
From August to 9th November 1850	22,629	511	8	4
(When the conservancy powers of the corporation ceased)				
For the year ending 9th November 1851	80,009	3,098	6	0
,, ,, ,, 1852	97,247	3,908	0	3
,, ,, ,, 1853	90,934	4,055	2	10
	662,136	27,247	6	4

Average cost per ton, of eleven years' dredging, 9⅞ pence, including all expenses of raising, conveyance, depositing, and keel hire, with all necessary repairs of craft and dredges, but not including the first cost of dredgers, which was 2,450*l.*

Furnished by Wm. A. Brooks, Esq., Engineer to Tyne Improvement Commissioners.

Appendix No. 19.

No. 19.

Sunderland Navigation Act.—Dredging Statement.

Amount of Material raised and deposited at Sea, with the Expenditure, for the Year ending December 31, 1853.

		Tons.	Total.
Lower Part of the Harbour.			
	Bar Sand	320	
	Sunderland Dock Entrance	17,330	
	Opposite do.	16,440	
	North Channel	72,990	
			107,080
Loading Berths.			
	Hetton Staiths	30,380	
	Lambton do	30,130	
	Monkwearmouth Colliery Staiths	28,200	
	Mounsey's Drop	3,840	
	Londonderry Drop	1,860	
			94,410
Mooring Berths.			
	North Quay	28,760	
	Ferry-boat Tier and Landing	8,190	
	Hulk Tier	7,210	
	Ayre's Quay	6,430	
	French's Wharf	2,600	
			53,190
Various Places.			
	Pallion Quay	1,780	
	Black Horse Sand	9,650	
	Folly End	4,140	
	Rock at Narrows	3,620	
	Hall's Dock	2,050	
	Rock at Bridge	880	
			22,120
	Total		276,800

	£	s.	d.
Materials	1,297	17	2
Labour	2,464	11	6
Total expense for the season	3,762	8	8

275,800 tons dredged out of the Harbour and deposited at sea, at an expense of 3,762*l.* 8*s.* 8*d.*, being at the rate of 3¼*d.* per ton.

Abstract of Work performed during 12 Years, from 1842 to 1853.

	Total quantity raised per annum.	Working Expenses.	Materials and Labour at Repairs.	Total Expenditure.	Average cost per ton.	Deposited.
	Tons.	£ s. d.	£ s. d.	£ s. d.	d.	
1842	128,245	922 1 2	1,570 13 11	2,492 15 1	4·665	In 5 fathoms water.
1843	141,325	879 16 0	1,360 7 3	2,240 3 3	3·804	„ „
1844	90,980	567 12 4	888 17 3	1,456 11 0	3·842	„ „
1845	101,075	721 9 0	930 3 4	1,651 12 4	3·921	„ „
1846	140,350	724 5 4	1,079 2 9	1,803 8 1	3·083	„ „
1847	89,470	477 0 11	1,199 7 1	1,676 8 0	4·496	„ „
1848	171,640	746 16 7	986 17 3	1,733 13 10	3·000	„ „
1849	176,920	865 17 7	2,055 19 0	2,921 16 7	3·750	„ „
1850	262,200	1,075 2 7	1,951 4 7	3,026 7 2	2·830	„ „
1851	177,070	821 19 11	960 15 1	1,782 15 0	2·330	In 10 fathoms water.
1852	178,230	1,005 19 6	1,731 18 1	2,737 17 7	3·675	„ „
1853	276,800	1,671 16 7	2,090 12 1	3,762 8 8	3·262	„ „
	1,934,305	10,479 18 6	16,805 18 1	27,285 16 7		

Average cost, per ton, of 12 years, 3·554*d.*

2nd January 1854.

Thomas Meik,
Engineer.

Appendix No. 20.

No. 20.

JOURNAL of the DEPTHS at LOW WATER on SHIELDS BAR, with the Rise of Tide and increase and decrease of Water by the Pilot's Mark, taken at Spring Tides. Kept by WILLIAM PEARSON, Ruler of Pilots.

The Pilot's Mark is when the Water is just washing over the top of Old Prior Rock there should be 12 feet water on the Bar.

(N. M. denotes New Moon, and F. M. Full Moon.)

Date.	Depth at Low Water.		Rise of Tide.		Bar worse than the Marks.		Depth of Water on the Bar.		Best of the Water. Bearing of Light-houses or Lawe Beacons.
1848	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	
June 1 N.M.									
„ 3 -	5	6	15	7	0	10	21	1	Light-houses just open to the northward.
„ 16 F.M.									
„ 19 -	6	6	12	6	1	0	19	0	Ditto.
„ 30 N.M.									
July 3 -	5	0	14	8	1	4	19	8	Ditto.
„ 16 F.M.									
„ 18 -	5	3	13	9	1	3	19	0	Ditto.
Aug. 1 N.M.	6	0	14	9	1	3	20	9	Light-houses 1 handspike open to the northward.
„ 16 F.M.	4	6	15	2	1	6	19	8	Light-houses 1 sail's breadth open northward.
„ 30 N.M.	5	3	14	6	1	6	19	9	Ditto.
Sept. 15 F.M.	3	10	16	1	1	6	19	11	Light-houses 2 breadths open to the northward.
„ 29 N.M.	Sea very high		-		-	-	-	-	Sea very high.
Oct. 14 F.M.	Sea very high		-		-	-	-	-	Sea very high.
„ 28 N.M.	Sea very high		-		-	-	-	-	Sea very high.
Nov. 13 F.M.	Sea very high		-		-	-	-	-	Sea very high.
„ 28 N.M.	6½	0	14	0	1	0	20	6	Light-houses 2 breadths north beacons just open to south.
Dec. 12 F.M.	6	0	15	0	1	3	21	0	Light-houses 1½ breadth open to the northward.
„ 28 N.M.	7	0	13	3	1	0	20	3	Ditto.
1849									
Jan. 12 F.M.	Sea very high		-		-	-			Sea very high.
„ 26 N.M.	7½	0	14	8	0	6	22	2	With the light-houses 1 breadth open northward.
Feb. 9 F.M.	7	9	14	0	No worse	-	21	9	With the light-house ½ a light-house open to the northward.
„ 25 N.M.	7	0	15	4	No worse	-	22	4	Light-houses 1½ breadth open to the northward.
Mar. 11 F.M.	7	0	13	6	No worse	-	20	6	Light-houses 1 breadth open to the northward.
„ 26 N.M.	6	3	16	0	No worse	-	22	3	Light-houses 1½ breath open to the northward.
April 9 F.M.	Sea very high		-		-	-	-	-	Sea high.
„ 24 N.M.	6	0	16	3	No worse	-	22	3	Light-houses 1½ breadth open to the northward.
May 9 F.M.	7	0	13	6	No worse	-	20	6	Light-houses 1 breadth open to the northward.
„ 24 N.M.	5	9	15	10	No worse	-	21	7	Light-houses 1½ breadth open northward.
June 7 F.M.	7	0	13	0	No worse	-	20	0	Light-houses 1 breadth open to the northward.
„ 22 N.M.	6	0	16	0	No worse	-	22	0	Light-houses 1½ breadth open to the northward.
July 7 F.M	7	0	12	10	No worse	-	19	10	Ditto.
„ 21 N.M.	5	6	16	4	No worse	-	21	10	Ditto.
Aug. 6 F.M.	7	6	13	2	6 in. better	-	20	8	Light-houses 2 breadths open to the northward.
„ 20 N.M.	5	4	16	3	4 in. better	-	21	7	Ditto.
Sept. 4 F.M.	6	3	14	3	The same	-	20	6	Ditto.
„ 18 N.M.	6	0	15	8	The same	-	21	8	Light-houses 1½ breadth open to the northward.
Oct. 4 F.M.	Sea very high		-		-	-	-	-	Sea very high.
„ 17 N.M.	6	6	14	9	The same	-	21	3	Light-houses 1 breadth open to the north.
Nov. 2 F.M.	6	0	15	9	The same	-	21	9	Light-houses 1½ breadth open north.
„ 16 N.M.	Sea very high		-		-	-	-	-	Sea very high.
Dec. 1 F.M.	6	2	15	8	4	0	21	10	Light-houses 1½ breadth open north
„ 17 N.M.	10	0	12	0	6 in. more	-	22	0	Ditto.
„ 31 F.M.	Sea too high to sound the bar.								

Date.	Depth at Low Water.		Rise of Tide.		Bar worse than the Marks.	Depth of Water on the Bar.		Best of the Water. Bearing of Light-houses or Lawe Beacons.
1850	Ft.	In.	Ft.	In.	Ft. In.	Ft.	In.	
Jan. 15 N.M.	Sea too high to sound the bar.							
„ 30 F.M.	Sea too high to sound the bar.							
Feb. 14 N.M.	Sea too high to sound the bar.							
„ 28 F.M.	6	0	16	0	6 in. better -	22	8	Light-houses 1 breadth open north.
Mar. 15 N.M.	Sea too high to sound the bar.							
„ 29 F.M.	6	3	15	4	3 in. better -	21	7	Light-houses 1 breadth open north.
April 13 N.M.	7	6	14½	0	8 in. better -	22	0	Ditto.
„ 27 F.M.	5	8	14	10	The same -	20½	0	Ditto.
May 14 N.M.	6	4	14	11	The same -	21	3	Ditto.
„ 28 F.M.	6	6	13	10	The same -	20	4	Ditto.
June 11 N.M.	6	5	16	2	7 in. better -	22	7	Ditto.
„ 26 F.M.	7	3	12	3	2 in. better -	19	6	Ditto.
July 11 N.M.	Sea too high to sound the bar.							
„ 26 F.M.	Sea too high to sound the bar.							
Aug. 9 N.M.	5	0	17	3	3 in. better -	22	3	Light-houses 1 breadth open northward.
„ 24 F.M.	6	11	13	6	3 in. better -	20	5	Ditto.
Sept. 9 N.M.	5	4	15	11	3 in. better -	21	3	Light-houses 1 breadth open north.
„ 23 F.M.	7	2	14	3	6 in. better -	21	5	Light-houses ½ breadth north.
Oct. 7 N.M.	Sea too high.							
„ 23 F.M.	7	4	14	2	2 in. better -	21	6	Light-houses 1½ breadth open north.
Nov. 6 N.M.	7	6	14	3	4 in. better -	21	9	Light-houses 1 breadth open north.
„ 21 F.M.	Sea too high to sound.							
Dec. 5 N.M.	7	2	13	6	The same -	20	8	Light-houses 2 breadths open north.
„ 21 F.M.	6	8	15	4	The same -	22	0	Light-houses 1 breadth open north.
1851.								
Jan. 4 N.M.	8	0	12	6	The same -	20	6	Ditto.
„ 18 F.M.	7	9	14	9	The same -	22	6	Ditto.
Feb. 3 N.M.	8	2	13	2	3 in. less -	21	4	Ditto.
„ 18 F.M.	5	6	16	6	8 in. worse -	22	0	Ditto.
Mar. 5 N.M.	8	6	13	9	1 ft. worse -	22	3	Ditto.
„ 19 F.M.	6	2	16	10	The same -	23	0	Ditto.
April. 3 N.M.	6	10	13	10	4 in. worse -	20	4	Ditto.
„ 17 F.M.	Sea too strong to sound the bar.							
May 3 N.M.	Sea too high to sound the bar.							
„ 17 F.M.	6	2	15	2	4 in. worse -	21	4	1 Light-house breadth open north.
June 2 N.M.	6	2	14	4	4 in. worse -	20	5	Ditto.
„ 16 F.M.	7	4	12	3	5 in. worse -	19	7	Ditto.
July 1 N.M.	5	2	15	9	3 in. worse -	20	11	Ditto.
„ 15 F.M.	7	5	13	1	The same -	20	6	Ditto.
„ 30 N.M.	5	6	15	9	The same -	21	3	1½ breadth open north.
Aug. 13 F.M.	6	3	13	9	The same -	20	0	Ditto.
„ 28 N.M.	5	0	18	0	The same -	23	0	1 Light-house breadth open north.
Sept. 12 F.M.	7	0	13	3	3 in. better -	20	3	1½ breadth open north.
„ 27 N.M.	Sea too high to sound the bar.							
Oct. 11 F.M.	7	0	13	2	6 in. better -	20	2	1 light-house breadth open northward.
„ 25 N.M.	5	0	16	8	The same -	21	8	Ditto.
Nov. 10 F.M.	8	0	12	6	The same -	20	6	Ditto.
„ 25 N.M.	8	0	14	0	1 ft. more -	22	0	Ditto.
Dec. 10 F.M.	8	0	13	3	The same -	21	3	Ditto.
„ 24 N.M.	Thick fogs, no marks to be seen.							
1852.								
Jan. 9 F.M.	Sea too high to sound the bar.							
„ 23 N.M.	10	0	12	0	1 ft. more -	22	0	Light-houses, 1 light-house breadth open north.
Feb. 7 F.M.	7	0	15	5	7 0	22	5	Ditto.
„ 22 N.M.	Sea too high.							
Mar. 8 F.M.	6	0	16	8	1 ft. better -	22	8	Light-houses 1 breadth open north.
„ 22 N.M.	8	6	14	0	1½ ft. better -	22	6	Light-houses just clear to the north.
April 6 F.M.	7	0	16	8	1 ft. better -	23	8	Light-houses in one.
„ 21 N.M.	9	0	13	4	2 ft. better -	22	4	Ditto.
May 5 F.M.	7	0	15	6	1 ft. better -	22	6	Light-houses just open north.
„ 21 N.M.	9	0	13	0	2 ft. better -	20	0	Light-houses 1 breadth open north.
June 4 F.M.	8	0	14½	0	1½ ft. better -	22	0	Light-houses just open to the north.
„ 19 N.M.	8	6	13	6	1 ft. 9 in. better	22	0	Light-houses just clear of each other to the north.
July 3 F.M.	8	6	14	6	2 ft. better -	23	0	Light-houses just open northward.
„ 19 N.M.	8	0	14	4	1 ft. 6 in. more	22	4	Light-houses just open to the northward.
Aug. 2 F.M.	8	0	13	9	1 ft. 6 in. more	21	9	Light-house just open to the northward.

Appendix No. 20.

Date.	Depth at Low Water.	Rise of Tide.	Bar worse than the Marks.	Depth of Water on the Bar.	Best of the Water. Bearing of Light-houses or Lawe Beacons,
1852	Ft. In.	Ft. In.	Ft. In.	Ft. In.	
Aug. 17 N.M.	6 6	15 0	6 in. better -	21 6	Light-houses just open northward.
„ 31 F.M.	7 6	13 6	1 ft. more -	21 0	Ditto.
Sept. 15 N.M.	Sea too high to sound the bar.				
„ 30 F.M.	8 0	13 6	1 ft. more -	21 6	Ditto.
Oct. 15 N.M.	6 6	17 0	1ft. 6 in. more	23 6	Ditto.
„ 29 F.M.	Sea too high to sound the bar.				
Nov. 13 N.M.	Sea too high to sound the bar.				
„ 27 F.M.	12 0	11 9	1 ft. 6 in. more	23 9	Ditto.
Dec. 13 N.M.	9 0	14 0	1 ft. more -	23 0	Ditto.
„ 28 F.M.	10 0	12 0	1 ft. more -	22 0	Ditto.
1853.					
Jan. 11 N.M.	8¼ 0	14 0	1½ ft. more -	22½ 0	Ditto.
„ 27 F.M.	Sea too high to sound the bar.				
Feb. 10 N.M.	Sea too high to sound the bar.				
„ 25 F.M.	Sea too high to sound the bar.				
Mar. 11 N.M.	8½ 0	14½ 0	2 ft. more -	23 0	Light-houses in 1.
„ 26 F.M.	8 0	16 0	2 ft. more -	24 0	Ditto.
April 9 N.M.	Sea too high to sound the bar.				
„ 25 F.M.	6 6	16 6	6 in. more -	23 0	Ditto.
May 10 N.M.	Sea too high to sound the bar.				
„ 24 F.M.	6 0	16 0	6 in. more -	22 0	Ditto.
June 8 N.M.	8 0	12 6	1 ft. more -	20 6	Ditto.
„ 23 F.M.	7 0	15 0	1 ft. more -	22 0	Ditto.
July 8 N.M.	8½ 0	12 8	1½ ft. more -	21 2	Ditto.
„ 22 F.M.	7 0	15 6	1 ft. more -	22 6	Ditto.
Aug. 6 N.M.	7½ 0	13 6	1 ft. more -	21 0	Ditto.
„ 20 F.M.	6 0	15 6	6 in. more -	21 6	Ditto.
Sept. 5 N.M.	5 0	15 9	The same -	20 9	Ditto.
„ 19 F.M.	6 0	14 0	6 in. more -	20 0	Ditto.
Oct. 4 N.M.	5 6	15 6	6 in. more -	21 0	Ditto.
„ 19 F.M.	Sea too high to sound.				
Nov. 3 N.M.	6 0	16 3	3 in. less -	22 3	Ditto.
„ 17 F.M.	7 6	13 4	6 in. more -	20 10	Ditto.
Dec. 2 N.M.	5 6	16 0	The same -	21 6	Ditto.
„ 17 F.M.	Sea too high to sound the bar.				
„ 31 N.M.	Sea too high to sound the bar.				
1854.					
Jan. 16 F.M.	Sea too high to sound the bar.				
„ 30 N.M.	10 0	14 0	2 ft. more -	24 0	Ditto.
Feb. 15 F.M.	Sea too high to sound the bar.				
Mar. 1 N.M.	8 0	16 0	2 ft. more -	24 0	Ditto.
„ 13 F.M.	7 6	15 6	1 ft. more -	23 0	Ditto.
„ 30 N.M.	7 6	14 10	1 ft. more -	22 4	Ditto.
April 15 F.M.	7 0	15 8	1 ft. more -	22 8	Ditto.
„ 29 N.M.	Sea too high to sound the bar.				
May 13 F.M.	7 6	15 6	1 ft. more -	23 0	Ditto.
„ 27 N.M.	8 0	13 6	1 ft. more -	21 6	Ditto.
June 12 F.M.	7 0	16 0	The same -	23 0	Ditto.
„ 27 N.M.	7 6	13 0	1 ft. more -	20 6	Ditto.
July 12 F.M.	Sea too high to sound the bar.				
„ 27 N.M.	7 6	12 8	1 ft. more -	20 2	Ditto.
Aug. 10 F.M.	5 0	17 1	6 in. more -	22 1	Ditto.
„ 25 N.M.	Sea too high to sound the bar.				
Sept. 8 F.M.	5 0	17 0	6 in. more -	22 0	Ditto.
„ 23 N.M.	6 0	14 8	same as marks	20 8	Ditto.
Oct. 7 F.M.	Sea too high to sound the bar.				
„ 23 N.M.	7 6	15 2	1 ft. more	22 8	Ditto.
Nov. 6 F.M.	Sea too high to sound the bar.				
„ 22 N.M.	Sea too high to sound the bar.				
Dec. 6 F.M.	12 0	10 0	1 ft. more -	22 0	Ditto.
„ 21 N.M.	7 6	14 3	1 ft. 6 in. more	21 9	Ditto.
1855.					
Jan. 5 F.M.	10 6	11 6	2 ft. more.	22 0	Ditto.
„ 20 N.M.	Sea too high to sound the bar.				

Note.—It may be remarked that in the years 1853 and 1854, the water on the bar was three feet better than the marks, and previous years the same.

Average depth in Shields bar at low water, spring tides, and average rise of the following flood tide, for the years 1851, 1852, 1853, 1854 :—

	Depth on the bar.	Rise of tide.
1851 -	6 feet 9¾ inches	14 feet 4 inches.
1852 -	8 „ 4 „	14 „ 4 „
1853 -	6 „ 10½ „	14 „ 9 „
1854 -	7 „ 6 „	14 „ 8 „

Appendix No. 21.

No. 21.

An ACCOUNT showing the TRADE of the PORT of NEWCASTLE, in the Years 1853 and 1854.

	1853.	1854.
Amount of duties received - -	£348,421 - - -	£341,355.*
Quantity of coals exported - -	998,304 tons - -	1,339,140.
Do. coastwise - -	2,131,417 tons - -	2,138,311 tons.
Number of ships inwards from foreign with cargoes - -	909 - -	1,169.
Do. „ do. ballast	1,762 - -	1,944.
Do. outwards, oversea cargoes	5,459 ships 880,849 tons	6,656 ships 1,119,934 tons.
Do. inwards coastwise do. -	2,531 „ 245,128 „	2,633 „ 262,860 „
Do. outwards do. do. -	11,501 „ 1,600,667 „	11,421 „ 1,667,165 „

Bill of Entry Office, Customs, Newcastle,
January 26, 1855.

* The decrease in the duties received in 1854, is caused by the reduction of the duty on tea.

Appendix No. 21 *a*.

No. 21 *a*.

An ACCOUNT showing the TRADE of the PORT of HULL in the Years 1853 and 1854.

	1853.	1854.
Amount of duties received - -	£350,530 - -	£321,286.
Number of ships from foreign with cargoes - - -	2,805 - -	2,730.
Do. do. in ballast	61 - -	59.
Do. outwards, oversea cargoes	1,596 ships, 318,830 tons	1,548 ships, 311,599 tons.
Do. inwards coastwise do. -	1,368 „ - - -	1,140 „
Do. outwards do. do. -	1,457 „ - -	1,638 „

Furnished from the Bill of Entry Office, Customs, Newcastle, to compare the Trade of the two Ports, Hull and Newcastle.

Appendix No. 22.

No. 22.

COPIES of PUBLIC NOTICES issued by RIVER TYNE CONSERVATORS.

CAUTION.

By the 54th Geo. III. Chapter 159, Section 11, it is enacted, that if the owner, master, or other person having the charge or command of any private ship of war, transport, or other private or merchant ship or vessel, lighter, barge, boat, or other craft whatsoever, or any person working any quarry, mine, or pit, near the sea, or to any harbour, haven, or navigable river, or if any other person or persons whatsoever shall cast, throw, empty, or unlade, or cause or procure to be cast, thrown, emptied, or unladen, either from or out of any such ship or vessel, lighter, barge, boat, or other craft, or from the shore, any ballast, stone, slate, gravel, earth, rubbish, wreck, or filth into any port, road, roadstead, harbour, haven, or navigable river of this kingdom, so as to tend to the injury or obstruction of the navigation thereof, or in any place or situation on shore where the same shall be liable to be washed into the sea, or into any such port, road, roadstead, harbour, haven, or navigable river, either by ordinary or high tides, or by storms or land floods; all and every such person and persons so offending, shall for every such offence forfeit and pay a sum not exceeding the sum of ten pounds, over and besides all expenses which may be incurred in removing to a proper place the said matters which have been deposited contrary to the provisions of the said Act, such expenses to be recoverable in such manner, and with such power of commitment for non-payment thereof, as in cases of penalties or forfeitures under the said Act.

Note.—Issued in the time of the old Conservators.

North Shields, 18 . WILLIAM WAKE.

Appendix No. 22 *a*.

No. 22 *a*.

CAUTION to MASTERS of SHIPS and others.

Notice is hereby given, that under the River Tyne Improvement Act, which came into operation on and from the 9th day of November 1850, any person who shall cast ballast or rubbish into the River Tyne, or into Shields harbour within the port, or into the Sea within two miles of the bar at the mouth of the River Tyne, or into the sea in any part thereof where the depth is less than ten fathoms at low water, will be subject to a penalty of ten pounds.

By order,

North Shields, July 18th, 1851. WILLIAM WAKE, Harbour Master.

Appendix No. 22 *b*

No. 22 *b*.

River Tyne Police.

CAUTION.

Whereas, by the River Tyne Improvement Act of 1850, it is enacted, That if any tenant or occupier of any wharf, staith, or quay, adjoining the river, permit any ballast or rubbish, cast or placed thereon, after the same is cast or placed thereon, and the apparatus used in casting or placing the same is removed, to be or remain on and within three feet of the edge of such wharf, staith, or quay, or cause or suffer any such ballast or rubbish to be cast or placed in or so near to any runner or water course upon or adjoining such wharf, staith, or quay, as that such ballast or rubbish, or any part thereof, is or may be washed into the river, to the prejudice thereof, every person so offending shall, for every such offence, forfeit any sum not exceeding five pounds.

Notice is hereby given, that if any person or persons should offend against the above law, they will be proceeded against before the magistrates.

By order.

Newcastle, December 28th, 1854.

Appendix No. 23.

No. 23.

A BRIEF STATEMENT of FACTS in favour of the Construction of a HARBOUR of REFUGE at the RIVER TYNE, by the Deputations from the Tyne Improvement Commissioners, and the several Corporations of Newcastle-upon Tyne, Gateshead, South Shields, and Tynemouth, the Newcastle-upon-Tyne, Shields, and Gateshead Chamber of Commerce, and the Shipowners' Societies of Tynemouth and South Shields.

For many years the North-east coast of England has been the scene of numerous disastrous wrecks, by which a great number of lives have been sacrificed, and a large amount of property destroyed.

According to the last published wreck-chart of the Admiralty, there were in 1852, within 30 nautic miles of the Tyne, 125 vessels wrecked; and within little more than 70 miles of it, north and south, there were, in the same year, 237 wrecks, of which 122 were attended with the total destruction of the vessels; which constituted nearly one-fourth of the entire wrecks upon the coasts and seas of the United Kingdom.

In the same year, in a single gale, on the 26th, 27th, and 28th of October, at the Tyne and within 30 miles of it, 47 wrecks occurred, and 69 lives were destroyed in the most terrible manner.

In January of the present year, in a gale from the east-south-east, within three days there were 110 vessels driven ashore within 30 miles of the Tyne, in which a number of people perished. Several vessels also were caught in the same gale and have never since been heard of, having probably foundered in attempting to keep the sea rather than run the risk attending the attempt to enter any of the dangerous harbours on the north-east coast.

A large fleet in this emergency attempted to enter the Tyne, and from amongst it not less than 36 valuable ships in those three days were driven on shore upon the rocks and shoals at its mouth, of which only one-fourth part (9 vessels) belonged to the port, and 28 of which within a week became total wrecks; thus was sacrificed in one gale property to the amount of nearly 100,000*l*., and, what is of still more consequence, several lives, under the most appalling circumstances.

At the same time, upwards of 200 vessels caught by the storm to the south of the three northern ports, fled past them to Scotland, in front of those terrible precipices which skirt the coast, and threaten destruction every hour.

In this gale not less than a quarter of a million sterling in value of property was lost upon the north-east coast.

All these disasters are to be ascribed to the dangerous nature of that coast, upon which an extraordinary number of vessels are at all times exposed.

For upwards of 200 miles, from the Humber to the Frith of Forth, there is an iron-bound coast, mingled with shores of treacherous sands; and in all that distance there is no certain place of shelter to leeward in heavy gales. On such a coast, so beset with dangers, there are exposed, during the year, in the North Sea, not less than 135,000 ships of all nations, besides vessels of war. The rivers Tyne, Wear, and Tees, with their dependent ports, have themselves, during the year, about 102,000 vessels entering and leaving their harbours; and every day in the year there are, on an average, 287 vessels on their seabord; so that no gale can arise that does not at once jeopardise a large amount of valuable life and property—while, on some occasions, there are not less than 1,000 ships and crews exposed to the same fate.

The river Tyne is thus, within about 70 miles, the centre of nearly one-fourth of the total number of wrecks of the kingdom; and within 30 miles has nearly one-fifth of its trading tonnage, amounting to upwards of seven and a half millions of tons.

These coasts, then, so terrible, and so productive of death and disaster, and at all times involving the safety of so many lives and so much property as to become of national importance, require some harbour of refuge.

The Tyne is peculiarly adapted for that harbour of refuge.

It possesses more tonnage than any other port on the north-east coast, and has in its capacious harbour a greater anchorage area. At one time, in a long-continued storm, it contained nearly 1,500 laden vessels afloat at all times of the tide. It has great maritime advantages, and being so much frequented, its navigation is well understood, and it is even now preferred amidst its dangers in a gale to any other north-east port.

A less frequented port, or a harbour constructed on any part of the coast exclusively for a harbour of refuge, in a heavy gale, would have its dangers enhanced by want of practical knowledge of its channels, bearings, and soundings, or its advantages refused for want of confidence in its security. The Tyne has a bar-passage of 660 feet, and seven feet depth of water over it at low tide, giving about 23 feet water in the flood.

By certain constructions suggested by eminent engineers, and approved and extended by the distinguished engineer appointed by the Admiralty, Mr. Walker, at least eight feet more water, it is confidently expected, will be obtained, giving in spring tides upwards of 31 feet water on the bar; at the same time the width of its entrance will be extended to 1,100 feet, affording thus in all weathers a safe and direct passage into its capacious harbour to vessels of all sizes and of the heaviest tonnage, whether merchantmen or men-of-war.

The ready means for accomplishing the work is all that is required.

Already the legislature and government, impressed with the necessity of harbours of refuge, have applied annually upwards of 200,000*l.* for their construction at Dover, Harwich, Portland, the Channel Islands, and Holyhead, all of which harbours united do not possess more than one-fourteenth of the trading tonnage of the Tyne.

The Tyne Improvement Act of 1852, enabes money to be levied on its shipping to the amount of 200,000*l.* for the construction of works at its mouth for rendering it safer and more accessible. Owing, however, to the slow process of raising the amount by local taxation, and the consequent delay in the execution of such works for many years, more property will be lost to the country by wreck during the time deferred than would probably have constructed such works, while hundreds of lives will also thus be sacrificed. Delay on this matter is not only dangerous, but certain death to many. It is believed that a representation to the legislature and government cannot fail under such circumstances to receive the most favourable consideration, as they have granted such liberal support to harbours so much inferior in magnitude and in disaster.

Every day that the works at the Tyne are left undone, leaves a large proportion of the shipping of the kingdom exposed to the most dangerous risks. At any hour the storm may sweep over the coast, and again give to destruction, as it did in the last gale, another quarter of a million of property, and bury hundreds of human beings amidst its wreck.

This is no local question.

The whole shipping of the world is more or less interested in it. Self-interest as well as humanity demand urgent attention to it.

At a moment when the gallant seamen of Britain are preparing to defend their country, and shed their blood for her and her interests, adding fresh laurels to her brow, it would bind them still more closely to her to give them for the future better security against the fearful conflicts of the storm, in which no courage can avail—but to enable them to die as becomes themselves and their country.

This case of a harbour of refuge at the Tyne is earnestly submitted to all who may be interested in the question (as who is not?) of the preservation of brave seamen from premature and terrible death, and national property from destruction.

Appendix No. 23. TABLE of STATISTICS in support of the "STATEMENT of FACTS" in favour of a Harbour of Refuge at the Tyne.

	Entered Inwards and outwards with Cargoes, from Parliamentary Return, 6th April 1853, No. 229.		Wrecks, From Admiralty Wreck Chart, 1853.				Harbours,		
			Within 10 Miles.		Within 20 Miles.		Bar Entrances.		Anchorage Area.
	Ships.	Tonnage.	Wrecks.	Total Wrecks.	Wrecks.	Total Wrecks.	Depth at Low Water.	Width at Low Water	
							FEET.	FEET.	
(1.) Newcastle—Tyne	27,233	3,730,255	66	31	103	48	7	660	Has contained 1,500 vessels, at the same time riding at moorings afloat. Is capable of harboring 2,000 vessels.
(2.) Sunderland—Wear	16,597	2,131,278	60	28	100	46	4	300	Will not contain 300 vessels in the Harbour without the Docks.
(3.) Hartlepool (Bay of Tees.)	10,117	1,370,789	40	18	100	47	3	150	Dry Harbour.
(4.) Stockton—Tees	4,258	422,279	38	17	75	45	From 7 to 6½ Series of Bars for Mile and Half.	Uncertain and Irregular.	Not room for 300 vessels of smalldraught. Average size of vessels, 101 tons.
Total Tonnage of the North-East Ports.	58,205	7,654,601							
(5.) Harwich	1,228	74,074	13	6	57	35	Harbour of Refuge.		
(6.) Dover	699	53,323	5	2	38	17	Harbour of Refuge.		
(7.) Portland	Nil. No Record in Parliamentary Paper.	Nil.	9	6	21	11	Harbour of Refuge.		
(8.) Channel Islands	3,185	149,894	9	6	9	6	Harbour of Refuge.		
(9.) Holyhead	Nil. No Record in Parliamentary Paper.	Nil.	16	6	32	15	Packet Station.		
Total Tonnage of Harbours of Refuge.	5,112	277,291							
(10.) Thames Ships	41,730	6,419,713	22	14	67	33	Open Estuary.		
Thames Steamers	5,860	1,625,323							
(11.) Liverpool Ships	23,608	4,438,327	20	6	30	9	Open Estuary.		
Liverpool Steamers	5,771	2,055,201							

NOTES.

No. 1.—While within 30 nautic miles of the Tyne, there were, in 1852, 125 wrecks, of which 70 were total; within the same distance of the Thames, including those at the Harbours of Refuge at Harwich and Dover, and the Goodwin Sands, there were only 70 wrecks, of which 35 were total. While the Goodwin Sands had 19 wrecks, of which 9 were total, during the whole year; the Tyne had 36 wrecks, of which 28 were total, on its seabord in one gale during three days. While within 70 miles of the Tyne, taking it as a centre, there are a fourth of the total wrecks of the kingdom, and one-fifth of its tonnage, no Parliamentary support has been extended to remedy these national disasters; yet from 20,000*l.* to 60,000*l.* are annually voted to each of the several harbours of refuge, which unitedly do not possess much more than one-fourteenth of the tonnage of the Tyne. To prove the Tyne's capability for heavy tonnage, the Sardinian screw ship-of-war the *Carlo Alberto*, of 2,500 tons, has been lying afloat in the harbour for several months. No port on the north-east coast but the Tyne would be able to keep her afloat. The Tyne alone possesses also steam-coal, where vessels of war can take on board their supplies.

No. 5.—Harwich has had Parliamentary votes to the amount of 110,000*l.* The sum voted last year was 20,000 (Parliamentary paper, 6th of April 1853, No. 304).

No. 6.—Dover has already received 176,000*l.* of public money. The estimated cost of the works are 245,000*l.* Last year 34,000*l.* were voted.

No. 7.—Portland has had from Parliament 195,000*l.* The estimated cost of the works are 588,959*l.* Last year there were voted 30,000*l.*

No. 8.—The Channel Islands have already received Parliamentary aid to the amount of 467,000*l.* for Alderney and Jersey. The estimated cost of the works are 1,300,000*l.*, without any aid whatever from themselves. Last year there were voted 60,000*l.*

No. 9.—Holyhead had voted to it, in 1851, a grant of 61,681*l.*

No. 24.

PROCEEDINGS on a DEPUTATION relative to the CONSTRUCTION of a HARBOUR of REFUGE at the RIVER TYNE. Appendix No. 24.

Proceedings on a Deputation to the Right Honourable Edward Cardwell, M.P., at the Board of Trade, on the Construction of a Harbour of Refuge at the River Tyne, Monday, March 6, 1854, the following Gentlemen composing the Deputation:

Joseph Cowen, Esq., Chairman of the Tyne Improvement Commissioners.
Ralph Dodds, Esq., Mayor of Newcastle-upon-Tyne.
David Haggie, Esq., Mayor of Gateshead.
John Robinson, Esq., Mayor of South Shields.
Matthew Popplewell, Esq., Mayor of Tynemouth.
Alderman Bartleman, of Tynemouth.
Alderman Clay, of South Shields, from the Tyne Commissioners.
John Dryden, Esq., of North Shields, from the Shipowners' Society of Shields.
James Mather, Esq., of South Shields, deputed by the Corporation of South Shields, and with Memorials from the Seamen.
A. G. Gray, Esq., Chamber of Commerce, Newcastle, Shields, and Gateshead.
C. Allhusen, Esq., Tyne Improvement Commissioner.
John Clayton, Esq., Clerk to the Tyne Improvement Commissioners.
Thomas Leitch, Esq., Town Clerk of Tynemouth.
Thomas Salmon, Esq., Town Clerk of South Shields.
James Walker, Esq., Civil Engineer.
Lord Lovaine, M.P.
J. F. B. Blackett, Esq., M.P.
Robert Ingham, Esq., M.P.
T. E. Headlam, Esq., M.P.
William Hutt, Esq., M.P.
James Lindsay, Esq.,
Peter Dickson, Esq., } Merchants and Shipowners.
J. Hay, Esq.,

Lord Lovaine: Sir, allow me to introduce to your notice in support of this scheme the gentlemen whom you see around you—Mr. Cowen, the Chairman of the Commissioners for the Improvement of the river Tyne—the gentlemen who represent the boroughs of Gateshead, Newcastle, Tynemouth, and South Shields, as their respective Mayors—the Chairman of the Shipowners' Society of South Shields (Mr. Mather), a gentleman who has taken great interest in the condition of the seamen of those ports—the members for the county, and also for the towns, whose names I need not mention to you. The object of those who are met here to-day is to procure your approbation to a scheme for the formation of a harbour of refuge at the mouth of the Tyne. Having made these observations, and brought to your notice the gentlemen who compose the somewhat numerous deputation, I shall leave it to the Chairman of the Commissioners for the Improvement of the River Tyne to explain the matter more fully to you; and we trust that, having secured your approbation to the measure, we shall be able to go with some hope of success to the Chancellor of the Exchequer, in the application which we are about to make for his assistance towards carrying out a scheme which is of the greatest possible importance to the traders in the river Tyne, as well as to the population inhabiting the shores of that part of the coast, and to the shipping interests at large.

Mr. Cowen: Sir, as Lord Lovaine has very properly stated to you, we are a deputation from the north, waiting upon you with a view of impressing upon you the necessity of the formation of a harbour of refuge at the river Tyne. I need hardly add, that you will see, by the large number of our body, the unanimity and strong feeling prevailing in that neighbourhood upon this subject, and the great importance attached to this measure; and we feel strongly convinced that it only requires that it should be brought fairly before your notice, with a sufficient number of the facts connected with it, to insure your support; and probably we cannot do that better than by referring to the statistical facts connected with the wrecks, and with the trading importance of the district. Perhaps the best way of putting the matter before you, will be to take the facts from authentic documents, as they appear in returns proceeding from the Admiralty and Parliament. I see the latest Admiralty wreck-chart, published in 1853, shows the number of wrecks during the year 1852 to be 125, within 30 nautic miles of the Tyne. We find, if we take the Tyne as the centre of a line of coast of 70 miles, in that distance we have one-fourth of the entire wrecks of the United Kingdom; and that we have, taking the river Tyne, the river Wear, and the river Tees together, one-fifth of the entire trading tonnage of the kingdom. This will, in some measure I hope, justify to you our present position, when we allge that it is a matter of no slight, but indeed of very great importance, not only in a local, but in a national point of view. Then we come to that which is vivid in the recollection of us all, and probably impressed many of us with a stronger feeling—if it is possible that we could be impressed with a stronger feeling—as to the necessity of such a work. We come to the month of January of the present year, and we find that, in the course of two or three days, 110 vessels were driven on shore within 30 miles of the Tyne, and out of that number 36 at the mouth of the Tyne. Of these 36, which is the peculiar circumstance or feature in the case, one-fourth, or only 9, belonged to the

Appendix No. 24.

port; the others were vessels belonging to other ports—some of them large foreign vessels, with valuable and important cargoes; and we estimate, at a moderate calculation, that there was at least 100,000*l.* worth of property lost, besides a considerable sacrifice of life, under the most appalling circumstances, which took place at the mouth of the Tyne on that occasion. We do not think that we over-rate it when we state that, on the north-east coast, during that gale, there must have been at least a quarter of a million of property sacrificed. Those, you will see, are strong and important matters for us to deal with. Now, probably, that appears to be a large amount of wrecks to have taken place; but, when we take into consideration that, for a space of 200 miles, from the Frith of Forth to the Humber, constituting the most dangerous coast in the kingdom, we have no harbour of refuge, or port, into which a vessel can run with any degree of safety on such an occasion, it is not a circumstance to be wondered at that we should have such a vast amount of wrecks on that coast. The Tyne, the Wear, and the Tees, have during the year about 102,000 vessels entering and leaving their harbours, which is a further reason why we have had a very large number of wrecks upon that very dangerous coast. This will bring me to the fact that, every day in the year, there must be something like 300 vessels on the seaboard of those three rivers; and occasionally, with a contrary wind for a few days only, but which very frequently continues for a period of weeks, upon a moderate calculation, we must have 1,000 ships, with their crews, exposed to this dangerous element. But there is a still more striking feature with which we are strongly impressed, and which only requires to be called to your attention, we think, to ensure your favourable consideration of our present object. We see that the united outward-bound sailing tonnage of the three rivers, the Tyne, the Wear, and the Tees, in the parliamentary return for 1853, amounted to 9,400 more ships than there were from London, Liverpool, and Glasgow united, and we have about an equal amount of tonnage. This is a fact probably not generally known. Great pains have been taken to verify those matters, in order that we might bring the fact fairly before you. It is no doubt very startling, but it is nevertheless a fact, which can be shown to be so. We therefore think, seeing the large amount of money which has been expended, and we think very properly expended, upon harbours of refuge, that we by no means make an unfair or unreasonable request, or anything but what is just and consistent, in asking for your kind approbation in recommending us to the Treasury for a sum of money that will assist us in making a harbour of refuge at the river Tyne. During the late gales, and during the time of the very high price of coals in London, we had a very large amount of vessels lying in the river Tyne laden, and this is a very important part of the matter, as making the river very desirable for a harbour of refuge, that it is not uncommon for us to have 1,500 vessels lying there, which cannot get out in consequence of the state of the harbour. During the late contrary winds, when the whole of the inhabitants of London were suffering from the very high price of coals, we had a large number of vessels lying ready laden in the river Tyne, but unable to get out in consequence of the defective state of the harbour—a defect which would be removed if we had the piers constructed, to which I will now refer. This naturally brings me to this point, that one almost wonders, and indeed one cannot help asking the question—How is it that nothing has been done for the north-east coast of England, such a dangerous coast, with such a large amount of tonnage, such an extent of property sacrificed, and, what is beyond that, and of more importance still, such an amount of human life sacrificed annually? We cannot, however, blame anybody for that, and we do not blame anybody. We have not, probably, done what we ought to have done in making this application at a much earlier period; at any rate, there are reasons now why we seek to make it, and seek your approbation in its favour. We obtained an Act of Parliament recently for the formation of piers at the mouth of the Tyne. By that Act of Parliament we are enabled to raise, by a tonnage rate on vessels, a sum equal to 200,000*l.*, but we find that very far from being adequate to complete such a work, and, besides, it is very desirable that the work should be completed within as short a time as possible. The means that we have of raising that money, if applied in the way we could apply it, according to our parliamentary powers, would in all probability cause the work to extend over a period of thirty years; and I need not tell you, therefore, that most of us would not have an opportunity of seeing any of the benefit that would arise from such an important work. We now, therefore, seek for your approbation, so as to secure the approbation of the Treasury, to an advance in aid of the Tyne improvement by the construction of piers, which would make a harbour of refuge at the Tyne, capable of affording shelter, under all circumstances, to something like 2,000 sail of vessels. We think the circumstances afford very just ground why we should ask for that aid; because, if this work be delayed, or spread over the period in which we have the money to raise by our own means, it would entail very great loss of property every year, besides considerable sacrifice of human life. I may further remark, that it is necessary, as you are aware, that this matter must be submitted to the Admiralty. We have agreed with the Admiralty that we would abide by the decision of Mr. Walker, their Lordships' engineer—that he should be left perfectly unfettered, as you will see by the Report; that, having taken into his consideration the various plans which were suggested, and been supplied with all the information he could get, he should lay down the plans which seemed best to him, and that we would abide by them. Mr. Walker has done the subject ample

justice; and we think there is great reason, on the part of every one, to be amply satisfied with Mr. Walker's report, and we are desirous to adopt it, but feel that we have not the funds to carry it out in anything like the time in which it is considered desirable it should be done. You will learn from that report that the Tyne is peculiarly applicable for a harbour of refuge. It has more tonnage than any other port on the north-east coast, and comprises a harbour which would contain 2,000 ships, and it is very much more frequented than any other harbour on the north-east coast of England. It is, indeed, rarely the case that any captain will sail upon that coast, unless he has been at some time or other in the Tyne; and now, even with all its difficulties, captains will take it at all times in preference to any other port between the Humber and the Frith of Forth. The circumstance of the frequency of captains going in and out, we feel to be a very strong recommendation in favour of making it a harbour of refuge. When the piers, which you will see by that plan, are constructed, we anticipate fully, and there seems to be no reason to doubt it, that we shall have at low water a depth of 15 feet, and that we shall have at spring tides fully 31 feet of water, with a width of 1,100 feet, amply sufficient to take in at all times the largest ships of war.

Mr. Cardwell: With 15 feet of water?

Mr. Cowen: We shall have 15 feet at low water upon the bar, and with the rise of the spring tides 31 feet, and we shall have an opening of 1,100 feet. These are, perhaps, the principal and leading features of the case. We do not want to overrate our statement; we want to state to you what are the facts which we think it is only necessary should be stated to induce your approbation, and, we trust, the approbation of the Treasury, to our proposal. With respect to the advantage of the harbour as a port of refuge, we think it would be essentially useful, especially in the present position of circumstances, when we are about to enter upon or engage in a war: that is even an additional reason why it should be made. We are aware that we may be met by this argument, and very likely shall, that it is a bad time to ask for public money, seeing that a large amount of expense must be necessarily incurred by the war which we are now engaged in, but we think that that is no just reason for suspending works of utility; it may be an argument against granting a large sum, and an argument in favour of granting a smaller sum; but we hold it to be no argument in favour of not going on with important works. Large sums, as I have said before, have been expended in harbours of refuge, and very properly expended. We think the spending of a fair proportion of the revenues of this country in that way is at all times, in a trading point of view, extremely desirable, for the sake of the merchants and shipowners, in saving their property from destruction, and equally desirable for the sake of saving the lives of that famous race of men whom we all esteem, and whose services we are at this time feeling that we shall require. Beyond these facts, I do not know that I have anything more to state to you on the subject. We think the case is a strong one, and we hope we shall be favoured with your approbation of the scheme which we have in view. Mr. Mather will state some facts to you with respect to the seamen whom he is here to represent, as well as being one of the deputation from the town of South Shields. I think it is as well, if Lord Lovaine will excuse me, that I should repeat to you distinctly the parties now before you, in order to show you that there is no misunderstanding or mistake with respect to the proposal, but that we are all perfectly unanimous upon the subject. There are a large number of people watching very carefully what we are doing, and the case is really exciting so much attention, and is deemed to be one of so much importance in the North of England, that I think you should know who are the parties taking that interest. In the first place, the River Tyne Commissioners are represented by myself as their chairman, and by Mr. Alderman Clay. The Corporation of Newcastle is represented by the Mayor and Town Clerk. The Corporation of Gateshead by their Mayor. The Corporation of South Shields by their Mayor, Mr. Mather, and the Town Clerk. The Corporation of Tynemouth by their Mayor, Mr. Alderman Bartleman, and the Town Clerk. The Shipowners' Society of North Shields by Mr. John Dryden. The Shipowners' Society of South Shields by Mr. Robinson, the Mayor; and the seamen of the north of England by Mr. Mather. I think it right that those facts should come before you, in order that you should have a distinct understanding of the importance attached to this proposal. I should state, also, that the Chamber of Commerce of Newcastle-upon-Tyne, Gateshead, and Shields, is represented by Mr. Gray. It is important that it should be understood not only by yourself, but probably by the country, that we have no difference of opinion; we are all working together to effect one common and great good, not only locally but nationally. We admit that it will be a great local advantage, but we are quite certain that it will be also a great national advantage, and we think that we have done our duty, and have done it to a great extent, in first of all agreeing to tax ourselves for the formation of these piers, which will operate to the formation of a harbour of refuge. We are prepared to propose, and we think it is not an unreasonable request, seeing that it will take from 350,000*l.* and 400,000*l.* to complete the whole work—we are prepared to go with the Government, hand in hand, by laying down thousand for thousand with them. We believe that we might, in all probability, accomplish the whole work in from five to seven years.

Mr. Gray: Sir, I am deputed by the Chamber of Commerce to support the application made to you for your favourable consideration of the scheme. We have sent you a copy of our memorial.

Appendix No. 24.

Mr. Cowen: I may remark, that the seamen of other ports are also about petitioning, which Mr. Mather will more fully explain.

Mr. Gray: The whole commercial body of the Tyne have agreed upon this question; and the Chamber of Commerce, as representing them, hope for your favourable consideration and that of the Government upon the application now made.

Mr. Mather: Sir, I am honoured, not only by being a member of the deputation of the Corporation of South Shields, but also to a certain extent representing the opinions of a very large mass of seamen, the seamen not only of the Tyne, but also of the port of Sunderland, where a rivalry has existed for many a long year: the latter, however, on this important subject, support the application from the Tyne. They have petitioned Parliament and Her Majesty's Government on the subject of the construction of a harbour of refuge at the Tyne. We have here to-day represented the material shipping interests of Sunderland as well as elsewhere. I may state we have here three very distinguished shipowners and shipbuilders. We have Mr. Hay, the largest shipowner, I believe, of Sunderland; Mr. Lindsay, so well known to the Board of Trade, who is present to support the views brought before you here to-day. We have also Mr. Dixon, a gentleman of large shipping property. We have also the Scotch ports in our favour, from which, if time had been afforded, you would have received a number of petitions. You have therefore, then, Shields and Sunderland, and Ipswich, Dundee, and Aberdeen, expressing sentiments upon the subject, that it will be for their interest, both for the safety of property and life, that this harbour should be made. Eighteen thousand ships proceed annually from Scotland into or along the coasts of the north-east ports, and those vessels have no security in the north-east gales whatever. If this project, you will allow me to say, is deferred to the time when the Tyne Commissioners are able to execute it, we shall have not less than a loss, according to the present proportion of losses, of 7,000,000*l.* worth of British property. If you can accomplish it speedily within a certain time, perhaps at a cost to the Government of 200,000*l.*, more or less, extra expenditure, you will save the balance of that large loss of property to the country, to say nothing of the enormous sacrifice of human life with which it must otherwise be accompanied. Taking it merely in a trading point of view, which I presume is the chief point you wish here to investigate, I would endeavour to impress upon you that it is a most important thing that we should have a harbour of refuge, with its attendant advantages, which would be the most largely experienced and participated in by the port of London itself. Looking at the cost of coal in the months of January and February, it is not difficult to show that there was a loss of as much extra money paid by the citizens of London for coal, as would have nearly constructed this harbour of refuge. We have now about from 6 to 7 feet of water over the bar of the Tyne. In the gale alluded to in January, and whose effects have been described by the Chairman of the River Tyne Commissioners, there were an enormous number of vessels detained by that and the succeeding gales in the Tyne. We had not less there than 1,100 or 1,200 laden vessels, with cargoes of coal, which, besides those from the other ports, the Wear and the Tees, would have brought, I venture to say, at least 200,000 tons of coals to London in a time of the greatest necessity; the want of which forced the price of your coals up here to nearly 60*s.* a ton. As soon as the wind turned northward, from the east-south-east to the north of east, they were detained, not by the gale, but by the heavy sea over the shallow water on the bar of the Tyne. Owing to that shallow water those 1,100 or 1,200 vessels were detained upwards of three weeks in that port, incapable of proceeding to sea; while if they could have got out you might have had your coals, I venture to say, at least 1*l.* per ton less than you had them under the circumstances. As soon as the wind changed round to the point most favourable to bring them to London, it raised the sea so high on the bar at the mouth of the Tyne, that they were unable to get to sea. Had that wind prevailed with deeper water, there was a certainty of those vessels proceeding to sea and getting within three days to the Thames with their supplies. Nor is this a solitary case. We have not unfrequently, during the season of London's greatest necessity for coals, large fleets of laden coal vessels lying in this manner, sea-bound, though with favourable winds, three, four, five, and sometimes six weeks together, putting London under a restricted supply of coals, and occasionally, as in the late gales, doubling their cost. London, in this way, will probably lose half a million sterling annually. A harbour of refuge and deep water would save all that. I may state also, that, I presume, in this war now pending, facility will be required to coal the steam fleets in every direction. The only steam coals supplied are obtained from the Tyne, except the anthracite coals from Wales. Suppose you want your steam supply of coals in this northern war from the Tyne, and contrary winds prevail from three to four weeks together, thus and for so long detaining the supply vessels in the Tyne. If Her Majesty's steam fleet is to be waiting for steam coals in the Baltic, or wherever they may be required, for three or four weeks, I fancy the entire operations of the fleet must cease or be crippled for a time. I understand from the engineer and the other eminent men who have been consulted upon this matter, that the process of throwing up these piers might be sufficiently advanced in a short time, perhaps in less than eighteen months, so as to get vessels of the largest size in and out of the Tyne. That would remove the difficulty. Already, I may state, as showing the capability of the Tyne, that there left it the other day a vessel, the "Carlo Alberto," a Sardinian frigate of 2,500 tons, drawing

from 21 to 22 feet of water. If those piers and works which we contemplate were constructed, vessels of the navy, such as steam frigates, would at any time be capable of coming and coaling, and at once could proceed to sea. Then, the commercial mode of treating the question may be further stated thus, as showing the importance of these northern ports, and the necessity of having some attention paid to them. We sent to London last year 3,300,000 tons of coal. London has altogether 6,000,000 tons of sailing vessels; therefore we sent upwards of one-half of the sailing tonnage that the Thames receives. Less than the other half go down channel—deducting nothing of that for the Baltic and the other northern parts of Europe. For the southern half of the tonnage you have prepared four harbours of refuge—two of them within twenty miles of each other—to say nothing of the security afforded at the Isle of Wight, Portsmouth, and Plymouth; whilst for the northern half going to London, for its line of coast, 200 miles in extent, you have prepared no harbour at all. I speak not of the lives which have been sacrificed —I speak now merely in a commercial point of view, of the great loss to the country from these perpetual sacrifices of property—a quarter of a million, as we have seen, being sometimes destroyed at a single blow. The great importance of providing for the preservation of all that British property which is at stake, and which might be preserved, is obvious. I do not say that those harbours of refuge on the south coast ought not to have been made. On the contrary, I think that the British Government deserves especial praise for having constructed them, for the security of British property, and the lives of British seamen bound up in that security. Therefore, so far from objecting to it, if I may be permitted to say so, I would give my respectful approbation to the continuation of those harbours of refuge. But permit me to look at the advantages derived from this outlay. I see, for instance, in a return made to the Admiralty in reference to Portland, that after expending 190,000*l.*, that on one occasion, in a gale from the south west, very like the gale that destroyed with us upwards of 100 vessels, Portland sheltered 18 vessels trading down channel, a portion of which being for the trade of Portland, I presume, in stone. This Portland on which you have spent so large an amount of money is within 50 miles of the Channel Islands, where you have also spent a large amount of money upon two harbours of refuge within 20 miles of each other. The Portland harbour of refuge, within 50 miles of these other two harbours of refuge, had a trade, it is said in that last Admiralty Report, of 40,000 or 50,000 tons a year. A trade to a harbour of 40,000 or 50,000 tons, giving shelter sometimes to 18 vessels in a gale, receives, therefore, 190,000*l.* of public money. Now, for the Tyne, we have got to set against that for the same time upwards of 3,700,000 tons, and a shelter at once from 1,200 to 1,500 vessels, though mingled with terrible losses. Now take the addition of the trading tonnage of the southern coast altogether, including Portsmouth and Plymouth, for which, I presume, so many harbours of refuge were constructed, and there is not one third of the amount of tonnage of the Tyne alone; therefore, I do think, if you spend annually the large amount of money, as shown in the parliamentary returns, for their protection, that you will mete out the same justice to the north-eastern ports, which we now respectfully require at the hands of Her Majesty's Government. Sir, I trust that although all the points have not been brought before you, for which we should probably not have time, yet that the facts which have been stated have thrown considerable light upon the subject, and that the great advantages of having a harbour of refuge, both as it regards the protection of the shipping interest in a commercial point of view, the saving of human life, and the advantages of supplying coals at all times, both to the fleet, above all to London, and to the various ports of the kingdom, will have so impressed your mind, as to ensure your favourable consideration of our proposal.

Mr. Cowen: I see here by my paper that the whole of the harbours of refuge united are only one-fourteenth part of the tonnage of the Tyne alone.

Mr. Cardwell: The subject which you have brought under consideration is one of the most interesting subjects that can possibly be brought before this Board, embracing the preservation of mercantile property, and, still more, the preservation of the lives of British seamen engaged in our trade. A deputation which came here the other day, recommended a different part of the coast to be selected as a harbour of refuge from the port which you have joined in recommending; but they desired that both projects might be considered as equally recommended by them, only they urged that a fair consideration should be given to the selection of their own, if the Government should be able to express an opinion either one way or the other. You have spoken of the other harbours of refuge, which have heretofore been constructed at the public expense, upon other parts of the coast. Now, as to those harbours of refuge, though no doubt it is very important that they should be of use to the trade of the country, yet other considerations have weighed most materially with the Government in spending the public money—that is to say, money derived from the general taxes of the kingdom—upon those harbours. They have been connected with the maritime defences of the country, or with the postal communication, or with some reason of that kind, constituting purely an imperial question. With regard to how far it may be right to tax the general public for the purpose of forming a harbour in a particular district, of course you will expect that that part of the case will be very narrowly scrutinized by those who are responsible for the expenditure of the public money. With regard to ourselves at this Board, you probably know that we instituted, about a year ago,

Appendix No. 24.

a general inquiry into the subject of the revenues of harbours, and the report of that commission will, in a very short time now, be laid before this Board, and we shall know more about the general bearing of that question when we receive it, than we do now. But you know that there are also reports which have been laid before Parliament, which point to a sum of money which had been raised in this very river the Tyne, and which, instead of being applied for the purpose of improving the navigation, had been applied to purposes wholly foreign to that object. For instance, I have in my hand the report of Captain Washington, in which he speaks of more than half a million of money having been applied to the lighting, paving, watering, and scavenging of the streets of Newcastle. Now that money, if it had only been applied to the purpose for which you now advocate the application of public money, would have done more than construct the whole of this harbour of refuge. I do not mean, at the present moment, to pass any opinion upon that subject; I only wish to notice it in passing; but the Commissioners are going to report in a week or two, and then I think we, at this Board, shall be in a better position for judging of the question than we are now. And while you may rely upon it we take the utmost possible interest in the subject of protecting the mercantile property, and still more of protecting the lives of parties exposed to the risks to which we see they are subjected, you must not understand anything that falls from me as amounting to anything like a pledge to go to the Chancellor of the Exchequer upon the subject. It may be right to do so, or it may not; but that we take the utmost possible interest on the subject, and that the case shall be considered, I can most heartily assure you.

Mr. Cowen: Just allow me to observe, that we do not mean for one moment to grumble, or to say anything about the construction of harbours of refuge in other places. You are quite aware that it is a system we by no means complain of; but on the contrary, we think it is a very useful mode of expending a portion of the revenue of this country. With reference to the other deputation you had here, we do not wish to say that you are not to do something for other places, as well as our own; nor are we here to say that ours is the only place that requires it; we are only here to say this, that if one part is to be selected, then the circumstances in which we are placed, by having the means of raising 200,000*l.*, make our position widely different from the others. In recommending our case to you, we do so with all respect to them and their position. With respect to the report of Captain Washington, you know that we, the Tyne Commissioners, are a body which was created in 1850. We say, as a matter of course, we have nothing to do with the bygones—we do not justify them, nor say that they were right or wrong; but we say that, so far as we are concerned, we are willing to do the utmost we can: we took the river as we found it at the time, and are willing to do the best we can. I do not support the Corporation of Newcastle, nor anything else connected with the past history of this river.

Mr. Clayton: I must say, with respect to the money said to have been expended by the Corporation of Newcastle, it arose from town dues which the Corporation spent in any manner they pleased, as they were then legally entitled to do, and as the Corporation of Liverpool do to the extent of 100,000*l.* per annum at this moment.

Mr. Cardwell: All that I have said with reference to that is, that the subject being under the consideration of the Commissioners, whose report will be presented to us in a short time, if you will allow me, I will see that report before forming any opinion upon the subject brought before me to-day.

The Deputation withdrew.

Proceedings on a Deputation to the Right Honourable Sir James Graham, Bart., M.P. and the Right Honourable W. E. Gladstone, M.P., Chancellor of the Exchequer, at the Admiralty, on the Construction of a Harbour of Refuge at the River Tyne, Tuesday, March 7, 1854, the following gentlemen composing the Deputation:

Joseph Cowen, Esq., Chairman of the Tyne Improvement Commissioners.
Ralph Dodds, Esq., Mayor of Newcastle-upon-Tyne.
David Haggie, Esq., Mayor of Gateshead.
John Robinson, Esq., Mayor of South Shields.
Matthew Popplewell, Esq., Mayor of Tynemouth.
Alderman Bartleman, of Tynemouth.
Alderman Clay, of South Shields, from the Tyne Commissioners.
John Dryden, Esq., of North Shields, from the Shipowners' Society of Shields.
James Mather, Esq., of South Shields, deputed by the Corporation of South Shields, and with memorials from the seamen.
A. G. Gray, Esq., Chamber of Commerce, Newcastle, Shields, and Gateshead.
C. Allhusen, Esq., Tyne Improvement Commissioner.
John Clayton, Esq., Clerk to the Tyne Improvement Commissioners.
Thomas Leitch, Esq., Town Clerk of Tynemouth.
Thomas Salmon, Esq., Town Clerk of South Shields.
James Walker, Esq., Civil Engineer.
Lord Lovaine, M.P.
J. F. B. Blackett, Esq., M.P.
Robert Ingham, Esq., M.P

T. E. Headlam, Esq., M.P.
William Hutt, Esq., M.P.
John Robert Mowbray, Esq., M.P.
The Honourable Henry Thomas Liddell, M.P.
H. G. Liddell, Esq., M.P.
James Lindsay, Esq., }
Peter Dickson, Esq., } Merchants and Shipowners.
J. Hay, Esq., }

Lord Lovaine: Allow me, Sir James Graham, and Mr. Chancellor of the Exchequer, to introduce to your notice the gentlemen forming this deputation on the subject of the construction of a harbour of refuge at the mouth of the Tyne—among others, Mr. Cowen, the Chairman of the Tyne Improvement Commissioners, the Mayors and Town Clerks of Newcastle, Gateshead, Tynemouth, and South Shields, Mr. Mather, the Secretary of the Shipowners' Association, and a gentlemen very deeply interested in the condition of the seamen in the northern ports. These gentlemen have waited upon you this day in the hope of impressing upon you the advantages to be obtained by erecting a harbour of refuge upon the mouth of the Tyne. They think that the advantages to be gained thereby are not by any means confined to that portion of the coast, or to the commerce of the towns which they represent. They think that the advantages to the whole empire would be such as to make it fully worthy of the notice, not only of the Admiralty as a naval station, but also of the Chancellor of the Exchequer as the guardian of the commerce and prosperity of this kingdom. Perhaps having said this, I had better conclude by simply asking Mr. Cowen, as the Chairman of the Tyne Commissioners, to open the question more fully before you.

Mr. Cowen: Sir, his Lordship has very properly noticed, in introducing us to you, the numerous advantages that will be afforded by the construction of this Harbour, and has referred to the various interests here represented, to show the unanimity of feeling that there is amongst us as regards the making the Tyne into a harbour of refuge. We look at it, not as conferring a local advantage merely. We are quite aware that, locally speaking, it will be of considerable advantage; but nationally, we are also prepared, we think, to show that it will be of very great advantage. In the first place, it will be well to call your attention to the number of wrecks which have taken place along the north-east coast. We find, from the Admiralty wreck-chart for 1853, which shows the total wrecks for 1852 to have been 485, more than 125 of these wrecks took place within 30 nautic miles of the Tyne, which is a very large amount of wrecks to have taken place in so short a distance. Then, if we take the Tyne as the centre of 70 miles of coast, which will, perhaps, be a fair mode of making the calculation from the chart, we find that 237 wrecks took place in the same period, of which 122 were totally destroyed, which is nearly one-fourth of the entire wrecks of the United Kingdom. We want, Sir James, to bring this before you, in order to show that the coast, although we do not say it is not a very fine coast, is at the same time a very dangerous coast, and hence arises the necessity for protection in the shape of a harbour of refuge. We also find, on looking to the trading tonnage account of the same district, that we average one-fifth of the entire trading tonnage of the kingdom, which is another very important fact, and one which we think is very material to be taken into consideration. That brings me to a subject more recently in the recollection of the Board, and one which, as we all feel, or, at least many of us, was a circumstance of a very appalling nature:—In the month of January, in the present year, we had 110 vessels driven on shore within 30 miles of the Tyne, and out of those 110 vessels, 36 were driven on shore at the mouth of the Tyne; and what is rather a peculiar circumstance, in order to show that the work would be national as to its advantage, only one-fourth of those 36 vessels belonged to the Tyne. We estimate that, by a fair calculation, the loss at the mouth of the Tyne was something like 100,000*l.* in that gale. Along the north-east coast, if there had been a harbour of refuge, a very large amount of property might have been saved, and would undoubtedly have been saved; and we do not think we over estimate it when we say that in that gale alone a quarter of a million sterling of property was sacrificed, independent of an immense amount of human life. Now, it is not to be wondered at that that is the case, when we find that we have no harbour of refuge for a space of 200 miles—from the Humber to the Frith of Forth. There is an immense amount of tonnage, which is continually passing in that direction, the safety of which, we humbly submit, is a subject worthy of your consideration. We find, also, in looking at the Tyne, the Wear, and the Tees that we have during the year about 102,000 vessels entering and leaving the harbours of those three rivers, within a space of 25 miles, consequently, we must at all times have 283 vessels (in round numbers) on their seaboard every day in the year; and, if we have contrary winds but for a few days—and we have them occasionally for many weeks—a moderate calculation shows that we must not have less than 1,000 ships and crews at times exposed to that dangerous coast. That seems to form a very important feature of our present position. But there is one other which I must just glance at, and which those who have looked into this matter are very forcibly struck by. I find, on looking at the outgoing tonnage of the three rivers—the Tyne, the Wear, and the Tees—by the parliamentary return for 1853, there were 9,400 more ships went out of those ports than from the ports of London, Liverpool, and Glasgow united. I do not know whether your attention has been parti-

Appendix No. 24.

cularly called to that, but it does seem to me to be an extraordinary thing, that such a number as 9,400 vessels should have gone out of those three rivers more than went outof the other three leading ports of the whole kingdom; while we have in those three ports about an equal amount of tonnage. There is another circumstance which is peculiar to these ports, that is, that one half of the sailing tonnage that leaves the port of London either passes by, or goes into, those three northern ports. This fact we get at from the returns made of the number of ships entered inwards to the port of London, and the return of the London coal market. Now, with all these things before us we submit to you that we are in a position to deserve some consideration in the shape of assistance for the formation of the Harbour of the Tyne into a Harbour of Refuge. We say *assistance* because we are peculiarly situated in this respect. We have an Act of Parliament for the formation of piers at the mouth of the Tyne, and, as probably you are aware, the plans and other things connected with the carrying out of the work under that Act of Parliament have been taken into consideration by your own Engineer, Mr. Walker, by an arrangement entered into between the Admiralty and the Tyne Commissioners, to the effect that Mr. Walker should have the whole matter laid before him, and that he should be left perfectly unfettered—that he should go into the matter both by taking evidence on the spot and elsewhere, and collect the best facts he could get, and that he should report on the subject. You, however, stipulated, and we think very properly stipulated, and we do not complain that you did so, that whatever Mr. Walker decided in his judgment ought to be done, should not be deviated from, either by the Tyne Commissioners or otherwise, without the consent of the Admiralty. That was a condition which imposes upon us a larger amount of outlay of money than we would otherwise have expended, inasmuch as the piers are to be taken out into deeper water, the consequence of which will be to make the harbour suitable for a harbour of refuge—which we might not as Tyne Commissioners have thought it desirable to have done under the powers which we have of raising money. Sir, you are aware that sums of money have from time to time been expended for the construction of harbours of refuge, which we think an extremely desirable mode of spending the public money, seeing the large amount of property which is lost, and the great sacrifice of human life which arises from wrecks on various parts of the coast. The southern ports have been provided for in that respect to a great extent, with which we are delighted to express our satisfaction; and we merely ask that you will be pleased favourably to consider the project which we have now in view, and that you will recommend that we should be aided in accomplishing that project by assistance from the public funds. I believe those observations almost bring me to a conclusion. I confess we have to charge ourselves with some little dereliction of duty that nothing has been done before now for this port in this respect, but we have had no means of bringing it forward. By our Act we have the power of raising 200,000*l.*, but that sum is very far from being adequate to complete the work From inquiries we presume that it is about half the amount required for the purpose. Now, taking it as a local advantage, for which the shipowners have agreed already to tax themselves, we are ready to do so to the extent of our means; but taking it also as a national thing, I hope you will agree with us in the justice of our application for assistance upon that ground. Another thing which I would also point out to you as showing that the Tyne is peculiarly adapted for a harbour of refuge is this:—we have frequently had something like 1,500 laden vessels in the harbour at once, all prepared to go to sea, but unable to do so from the state of the harbour. We have no doubt that, by the formation of these piers, we should be able to give accommodation to 2,000 vessels. Therefore, irrespective of the enormous amount of trade already done in that neighbourhood, and preparing to be done, there would be a large amount of room available for the accommodation of the navy, if necessary. Another important thing is, that the Tyne is a port more frequented than any other port on the north-east coast. There are rarely any captains sailing along that coast who have not been at one time or other in the Tyne. Consequently, no objection can be raised as to its being a place not generally known; but, on the contrary, it is very much frequented, and extremely well known. There is another part of the subject which, at the present moment forms a very important feature in the case. The Tyne Commissioners, by their Act of Parliament, are now forming a very important and a very large dock in the River Tyne. Now, last year, about a million and a quarter of tons of steam coal were shipped from our port. Really, when one goes into these things, they are most startling. A million and a quarter of tons of steam coal were shipped in this immediate locality, where the Tyne Commissioners by their Act of Parliament are now forming docks. And with respect to those docks, it may be remarked, that there is no profit to arise from them to any one, because, when they have paid their expenses, they will be thrown open to the public. Now seeing that we are preparing a dock to take in the largest steamers that have ever been constructed, there will exist this large Dock for vessels to go into to take their coals on board, and to go out on the coast, or wherever it is necessary for them to go, in order to defend that which we, as Englishmen, say we ought to defend—our country—against whoever attempts to endanger our liberties, or our property. We say that is a very material part of the case; it is highly important, inasmuch as at all times the largest steamer could go in and take her coals—could be put in that dock and taken out to deep water, so as to proceed to sea without delay—in short could go in and out whenever she liked—we say upon that score, irrespective of its being a harbour of refuge for vessels to go to in case of distress,

it forms a very important part of the scheme we have before us. There is no other port, or at least no other port where steam coal can be got for supplying the steam navy, on the north-east coast. The other ports that are on the south of us will not serve that purpose; therefore, as we have the steam coal in the Tyne, it renders it still more desirable that the harbour of the Tyne should be made of such capacity as to enable it to take in those large vessels at all times. I am sure we all feel exceedingly desirous that that should be done, because we are probably at the present moment rather in that peculiar position, that although Englishmen do not delight in war, yet we must delight in seeing that we have places to which we can take our largest ships of war in case of emergency. I see, sir, that by the construction of these piers, we should deepen our water to the extent of having 15 feet at low water on an ordinary spring tide over the bar: that at high water we should have three, four, or five feet more than would be required by the largest man-of-war, or the largest steamer. I say that we should have 15 feet at low water, and that is a strong feature, because all the ordinary trading tonnage passing along the coast could go in at low water, and of course at high water the largest vessel we have yet known would go in, and not only go in with that depth of water, but would have several feet to spare, by the construction of the piers. I am glad to have this opportunity of stating what we are unanimously agreed upon. There is no difference of opinion among the River Tyne Commissioners, or with any one interested in them; and therefore I am only doing right to Mr. Walker to say, that we unanimously approve of what he has done. By the construction of those piers there would be an entrance of 1,100 feet in width, and it would be an extraordinary gale indeed, if vessels with 1,100 feet of water way could not go in with safety. I may also remark, that the seamen in other ports, I believe both northward and southward, have been, and are now, petitioning in favour of the proposal. In fact, there can be no difference of opinion, that if we are to have a port of safety or a port of refuge on the north-eastern coast, the Tyne is the place for that purpose. I am not here to say that it is not right for Her Majesty's Government to take notice of other places. We do not take it upon that narrow basis at all; but we take it upon the favourable position in which we are placed. We have the means of raising 200,000*l.*, and consequently the opportunity of raising, as we say, one half of the necessary amount; but if we were to raise that sum, the annual amount only being about 10,000*l.*, it would extend over thirty years, or more than that, before we could do it. And if you look at the immense sacrifice of property which must take place, to say nothing of the enormous amount of loss of life that would be consequent upon that delay, that would be, in fact, subjecting a large number of men, we say, to certain death; it is, we think, exceedingly desirable, not only that the piers at the mouth of the Tyne should be constructed, but that they should be constructed as speedily as possible; and we venture to hope that our present project will meet with your favourable consideration, and that of the Chancellor of the Exchequer. We believe that the whole works could be completed in from five to seven years, and we think it would be extremely desirable, in a national point of view, to have it completed in so short a period. You must not, however, understand, that it would be that time before we should receive the benefit to arise, because long before that the work would be in such a state of forwardness that at once great benefit would be derived, nationally and locally, from it. Sir, I fear that I have taken up too large a portion of your time. I will introduce, with your permission, Mr. Mather, who will present petitions from various bodies of seamen, and who is also one of the deputation from the corporation of South Shields, and who will take the opportunity of addressing you upon the subject.

Mr. Mather: Sir, I have the honour of presenting to you a memorial from the seamen of the south of the Tyne, praying you to grant your favourable consideration to this scheme of a harbour of refuge at the Tyne. This is its prayer:—"Therefore your "memorialists humbly pray your Honourable Board to adopt such measures as will protect "your memorialists for the future from those terrible disasters that destroy so many British "seamen, and erect the Tyne into a national harbour of refuge." These, Sir, are not only the opinions and prayer of the seamen of the South of the Tyne, but those of the seamen of other ports. The member for South Shields has already presented a petition to the House of Commons from the seamen of Sunderland, praying that it will sustain the project for a harbour of refuge at the Tyne. In addition to that there is a petition from the seamen of Ipswich, which also urges the necessity of some better security for life and property in this navigation on the coasts of the Tyne; and from Aberdeen and Dundee memorials are expected, urging similar views, although not yet arrived; but on their arrival will be immediately laid before this Board and Parliament. Seeing the dangers, therefore, to which seamen are exposed, and whose families are every hour liable to be left without protection, whose lives are being perpetually sacrificed by the storm, it is our anxious desire that the Admiralty will be pleased to sustain the project now under consideration, approved already by its engineer, which will place the seamen under great obligation, and for which, also, I am sure we shall all be most thankful. Sir, if we go on as now, we shall lose, in a very few years, according to the rate in the Admiralty Chart, a very large number of our seamen. We lose annually now upon our coasts in the north one quarter of the seamen who are wrecked upon the coasts and seas of the entire kingdom. If we keep destroying at that rate, in a very few years we shall have lost six or seven thousand British seamen, who might have been alive to bless their families and serve

Appendix No. 24.

their country. Therefore, I do feel it to be a strong argument here, that those men, so important to the country in the hour of danger, should at no time have unnecessary danger thrown upon them; but should be saved from the conflict of the elements, if necessary, for the conflicts of war, in which they can so well serve their country. In a single gale, some time ago, in one day, we had 70 seamen destroyed. Had this harbour of refuge been constructed, the advantages of which have been so well pointed out by the Chairman of the Commissioners, those lives would have been saved, as well as an immense amount of property. In one day (in January last) we lost a quarter of a million sterling, by the destruction of shipping; if that amount is lost, even by the year, for the 30 years which must elapse before these piers are constructed—if, without assistance, we are obliged to construct them ourselves—there will not be, on a moderate calculation, a less amount than seven millions of property destroyed. I also think that this is an important argument in our favour, that if you do not take the Tyne, on the north-east coast, you can get nothing else. You are there in a strong position to guard the shipping property of the country, amounting on that coast to one-fifth of that of the kingdom; and there is no other harbour, north or south of us, as is well known, suitable for the purpose. There is no harbour for 200 miles into which it is possible to take the smallest frigate; whilst here, with a little aid from the Government, there will be no difficulty whatever in making our depth of water in the Tyne from 30 to 32 feet at high water, and which would take in men-of-war of the largest tonnage. It is also a matter, I presume, for your consideration here, that in the desperate conflict in which we were about to enter, and from what we have already seen of the daring, and at the same time ferocity and want of generosity in war of our present enemies, should a gale from the east come on, and our frigates upon the north-eastern coast of England be driven either to the Frith of Forth or to the southern port of the Humber, or probably to the south of that, all the amount of property which we have described would be left entirely exposed to the vessels of the enemy; for the gale that scattered our vessels of war, and drove them off the coasts, would bring upon them the enemy's cruisers. If any steam frigates of the Russian fleet at such a time were at the mouth of the Baltic, a gale from the east would bring them upon the north-east coast in 48 hours; and however well protected we might deem ourselves, our crowded harbours would be exposed to an attack, and probable destruction, and the coal supply to London would be seriously endangered. I will not dwell upon this matter; but I do think that it is an important consideration in connexion with the scheme which is now proposed. With regard to harbours of refuge, the Government having been so generous in other matters of a similar kind, at the southern ports of the kingdom, we cannot but look on that with feelings of satisfaction as a source of hope for ourselves. It is a very important thing that if the seamen so exposed can be saved from destruction, as well as a very large amount of British property—it is a most important thing indeed that that should not be neglected for the sake of a few thousand pounds from the nation, which is bound to protect life of national importance, and property of national value. It is hoped that less than 200,000*l.* is all that is necessary to secure these great public objects. Sir, I certainly think we may take blame to ourselves, that up to this period we have not called the attention of the Government and Parliament to the subject, or till these circumstances have been brought before us almost by a series of acts of Providence; but we have now felt so strongly our position, that we could no longer resist the influence, under which we have come here to do our duty, and remove from our own consciences that blame which seemed to attach to us, and to place the responsibility upon the Government and Legislature. If you will allow me to mention one matter, though it is scarcely necessary to do so, but I have heard it stated that it must be known to this Board that some of the money which we might derive from our local resources should be applied to this measure. I may state that any other money from local taxation which we should be likely to get, if we could, has been ceded by Act of Parliament, with the sanction of Her Majesty's Government, a very short time ago; and if transferred to the funds of the river, would go to reduce the heavy taxation of the Tyne, and not to construct a national harbour, the duty of the nation. For the other facts and arguments on this case we beg to refer you to our memorials to Government and our petitions to Parliament.

Sir James Graham: The Chancellor of the Exchequer and I are very much obliged to both the gentlemen who have stated the case so clearly to us. There can be no doubt that the multiplication of harbours of refuge would be of great national advantage. With respect, however, to the peculiar circumstances of the present moment, as it relates to defence, I am bound to think that, independently of any other port, the Harbour of the Humber would supply all the wants that are immediately necessary for ships of war. Then, with respect to the multiplication of harbours of refuge, even in times of peace, if the expense is to be borne out of the national funds, there must be some limit to the annual outlay. We have at this moment three great works in progress; one of them drawing to a conclusion, that of Holyhead, a great work with a great expenditure. At Portland, we have a harbour of refuge, the only one in the channel considerably advanced, but still with a very large and necessary outlay in prospect: and at Dover also a third with a very large outlay, and the work but half finished. Even in times of peace it would not be possible to expect from the public purse more than a limited contribution for a national object, even of such great importance, as I admit this to be. At the present

moment, however, with the prospect of a war, which, I am afraid, will be a very expensive one, of course the time is not very opportune to ask for a further outlay than, even in times of peace, I should think the national resources should bear; inasmuch as at the present moment there are works still incomplete, and therefore these resources are sufficiently charged for works of this kind. But, then, suppose that the objections in that respect should be overcome, and it were admitted that between the Humber and the Firth of Forth a harbour of refuge were really necessary, that would leave a very grave question to be considered, as to what should be the site to be chosen for that purpose. I have already had here strong recommendations from Hartlepool, through the gentlemen from Hartlepool, who say that that harbour would be a good place. Then there was a strong representation made that Redcar was the best possible site. Therefore, even if the other difficulty were overcome, we should have to consider which is the precise locality between the Forth and the Humber that ought to be selected for a harbour of refuge. Then it is not possible to over-estimate the vast importance of the Tyne. But nature has been somewhat niggardly in giving advantages to that river. It has still a dangerous bar upon it; but the general trade, combined with the coal trade, has struggled against nature, though at a fearful sacrifice of life, from time to time, owing to the great disadvantages of that bar. I have very great confidence in the judgment of Mr. Walker, and he says that he is very certain that he could struggle against those natural disadvantages —that he has a very fair prospect, in a great measure, of overcoming the difficulty. But it is also admitted, that even with the work which Mr. Walker has recommended, there would only be 15 feet at low water at the entrance of the Tyne. Then I do not wish to enter into the more disputed question with regard to the local funds; but still the trade of the Tyne is great, and the receipts from the shipping in the Tyne are very great, and I do not think that the whole of those receipts have been applied to the Tyne Navigation purposes. There are local funds to a very large amount, which, if they were applied altogether to the benefit of the shipping, would be more than sufficient to meet the whole of this outlay. However, this is opening a question of local funds which is much disputed, though still it is not altogether out of the question with reference to this subject. The main difficulty, as it appears to me—and the Chancellor of the Exchequer will state his view to you—but the main difficulty is, that with the very large source of expenditure now opened, the drain upon our resources for harbours of refuge still incomplete, but which must be finished, being very considerable, to hold out an expectation of further outlay by recommending new works in the shape of a Harbour of Refuge between the Forth and the Humber, would be hardly consistent with our duty at this moment. The Chancellor of the Exchequer will tell you what is the view which he takes of this matter—that is my opinion.

The Chancellor of the Exchequer: I am afraid I am bound to concur in what Sir James Graham has said with reference to the difficulties he has mentioned to you, as lying in the way of the attainment of your object. There is one other point which, it appears to me, it would also be necessary to take into consideration, in addition to what Sir James Graham has referred to. It is this: you have alluded to the liberality of the country with reference to erecting harbours of refuge on the southern coast; but, at the same time, it must be remembered that all those harbours of refuge upon which the money of the nation has yet been laid out, so far as I am aware, are harbours of refuge at places where there is absolutely no trade at all, or where there is no trade or no amount of local property at stake, which would at all justify the laying upon the locality the burden of the erection of so great a work. So far as I am aware, the contribution of a large sum by the nation towards the erection of a harbour of refuge upon the Tyne would so far partake of the nature of a novelty, that it would be extending to a very great port, where there is an immense amount of trade, and an immense amount of property at stake, a principle which hitherto has received no sanction. I do not mean to say that it might not be proper in some cases, or that I am in a situation to form a conclusion upon the question whether that ought to be at all times an absolute bar to having a harbour of refuge assisted by the public funds; but I think it a very serious question for consideration, and that it would be one which I think it would be the duty of the Government to weigh very maturely, even supposing that the other difficulties were overcome, before it would be possible to give an answer to what has been expressed here to-day.

Mr. Cowen: Sir, you have very properly, I think, compared us with the other places on the east coast, which may have pretensions to like purposes with ourselves. Sir, we have no desire whatever to prevent the other ports from benefiting in any way they can upon that ground—we think it is right they should—we only say, that if anything is to be done, we are thoroughly convinced of the advantage to be derived, nationally, by doing that which we now ask; and we are so thoroughly convinced, on this ground, that ours is decidedly the best place at which to do it. But there is also one other particular in our favour, namely, that we already can raise a sum of money—and these are operations which cannot be carried on without—therefore, that is the advantage of the position in which we are placed, that we have already the opportunity of raising a large sum of money—say half the amount—and we are willing to raise, locally, half the amount for our share of the advantage; but the other half, we say, would clearly be an advantage to the country at large. You have alluded to a certain subject which was also alluded to

Appendix No. 24.

elsewhere as to the local revenue of the place. I am sure that it will not be my duty or desire to say anything at all that can be either offensive or improper; but I do not think, if you will pardon me for saying so, that that is a fair way of putting it. I am one of the Commissioners appointed by the Act of Parliament of 1850; they constitute a body of eighteen, four of the Commissioners being appointed by the Act, the others being elected by the various municipalities. Now, really, we can have nothing at all to do with what took place before our appointment, and it is not fair to heap upon us the sins of our predecessors. By our Act of Parliament a bargain was made, it received the sanction of Parliament and Her Majesty's Government. It might be a right or a wrong one. But I, as one of the Commissioners say—there it is as it is—we take the river Tyne as we have found it, and we are exceedingly desirous to go on improving it in every sense of the word, as far as our funds go; but we think it is not a fair way of meeting the case, to say that some parties who went before us had not done what they ought to have done. Again, I think you stated, which shows that probably there may be a prospect for us, that one or two of those harbours of refuge are not completed.

Sir James Graham: That they will not be completed for some years.

Mr. Cowen: We are not here to say that one farthing of that money has been laid out in any other way than a very useful and a very proper way. We think it is a very fair and proper way of expending the public money. We only say, that we think we are entitled to a fair proportion of that which is to be laid out.

Mr. Mather: Will you permit me to say one word as to the southern ports. You alluded just now, I think, to the ports in the south channel having no protection previous to the execution of those works.

The Chancellor of the Exchequer: I alluded to them having no great trade of their own.

Mr. Mather: Just so; and that is our case. Now, it can be shown that within every 50 miles they have got a perfectly secure harbour. There are—Dover, and its harbour of refuge; Portsmouth, with its security; Portland, with its harbour of refuge; the Channel Islands, with their two harbours of refuge; and Plymouth, with its security—six harbours of refuge, as it were, within a short distance of each other, for tonnage which, with that from London, is scarcely more than that from the Tyne itself. In 200 miles of coast, whose dangers and disasters have been already described, we have not one harbour in which, in a gale, ships can shelter. And not only that, as we have seen, but the trade which we have to shelter is greater than that of the entire southern coast, with that of London that goes down Channel. We send into the Thames more than 3,300,000 tons out of a little more than 6,000,000 of sailing tons which she has in all; and that the entire trading tonnage of the Channel, for which six harbours of refuge have been provided, is not a million in itself, whilst there are 7,600,0000 trading tonnage on the north-east coast entirely unprotected for 200 miles by a single harbour of refuge. I do, under these circumstances, hope that Her Majesty's Government will take the matter into their consideration, and grant us what we ask. I can only say, that this is a much more important case than that of the Channel, for which so much has been done. It cannot be really meant that fewer lives and less property are to have the nation's care, whilst those that are so much more valuable are to be neglected. Such a principal is careful over small things, and leaves to perish those of national importance.

Sir James Graham: I am very much obliged to you, I am sure, as is the Chancellor of the Exchequer also, for the manner in which you have brought this subject before us.

Appendix No. 25.

No. 25.

List of the Tyne Improvement Commissioners, 1854-5.

Mr. Ralph Dodds,
Mr. Thomas Ridley,
Mr. William Armstrong,
Mr. John Ormston,
Mr. John Rayne,
Mr. Ralph P. Philipson,
} Newcastle.

Mr. Christian Allhusen,
Mr. Alex. Geo. Gray,
} Gateshead.

Mr. William Linskill,
Mr. Joseph Straker,
Mr. Matt. Poppelwell,
} North Shields.

Mr. John Robinson,
Mr. John Clay,
Mr. James Mather,
} South Shields.

Mr. William R. Hunter,
Mr. Joseph Cowen,
Mr. William Purdo,
Mr. James C. Stevenson,
} Named in the Act.

Auditors.

Mr. Thomas Hedley, Newcastle.
Mr. James Smith, Gateshead.
Mr. George Henry Lamb, North Shields.
Mr. Robert Ekles, South Shields.

List of the Standing Committees appointed by the Commissioners.

Finance Committee.

Mr. Joseph Cowen,
Mr. Thomas Ridley,
Mr. John Ormston,
Mr. Christian Allhusen,
Mr. James Cochran Stevenson,
Mr. William Armstrong,
Mr. John Rayne,
Mr. Joseph Straker.

Appendix No. 25.

Howdon Property Committee.

Mr. Joseph Cowen,
Mr. William Linskill,
Mr. Matthew Poppelwell,
Mr. Ralph Dodds,
Mr. Joseph Straker,
Mr. John Clay,
Mr. James Mather,
Mr. William Rutherford Hunter.

Police and Ballast Committee.

Mr. Matthew Poppelwell,
Mr. John Robinson,
Mr. Joseph Straker,
Mr. William Linskill,
Mr. James Cochran Stevenson,
Mr. Joseph Cowen,
Mr. James Mather,
Mr. Thomas Ridley,
Mr. Alexander George Gray,
Mr. John Rayne,
Mr. John Clay.

Piers Committee.

Mr. Joseph Cowen,
Mr. Thomas Ridley,
Mr. John Ormston,
Mr. Ralph Dodds,
Mr. Joseph Straker,
Mr. Matthew Poppelwell,
Mr. John Clay,
Mr. James Mather,
Mr. Alexander George Gray,
Mr John Robinson,
Mr. Ralph Park Philipson.

Northumberland Dock Committee.

Mr. Joseph Cowen,
Mr. Thomas Ridley,
Mr. John Ormston,
Mr. William Purdo,
Mr. James Cochran Stevenson,
Mr. John Robinson,
Mr. Joseph Straker,
Mr. John Rayne,
Mr. Christian Allhusen,
Mr. Matthew Poppelwell,
Mr. Ralph Dodds.

Mooring Committee.

Mr. William Rutherford Hunter,
Mr. John Clay,
Mr. Matthew Poppelwell,
Mr. William Purdo,
Mr. Thomas Ridley,
Mr. John Robinson,
Mr. James Mather.

River Lines Committee.

Mr. William Rutherford Hunter,
Mr. Joseph Cowen,
Mr. James Cochran Stevenson,
Mr. William Purdo,
Mr. John Ormston,
Mr. John Robinson,
Mr. Ralph Park Philipson,
Mr. Matthew Poppelwell,
Mr. Christian Allhusen.

Dredger Committee.

Mr. Joseph Cowen,
Mr. John Rayne,
Mr. Matthew Poppelwell,
Mr. John Robinson,
Mr. Alexander George Gray,
Mr. Thomas Ridley.

Days appointed for the Monthly Meetings of the Commissioners.

1854—December 14.	1855—April 12.	1855—July 12.	1855—October 11.
1855—January 11.	„ May 10.	„ August 9.	„ Nov. 8.
„ February 8.	„ June 14.	„ September 13.	„ Dec. 13.
„ March 8.			

No. 26.

Appendix No. 26.

Correspondence on the Construction of the Piers at the Mouth of the River Tyne, between the Admiralty, the River Tyne Commissioners, and James Walker, Esq., C.E.

Sir, Admiralty, 24 February 1853.

I have to acknowledge your letter of the 14th instant, in which you request the Admiralty assent to the works at the mouth of the Tyne (authorized under the Act of last Session), and, it is understood, on the precise centre lines shown on the plans deposited with Parliament.

From the very extensive limits of deviation shown on the Parliamentary plans, "including (as the Admiralty Inspector observed in the Report of the 21st April, last year) space for the adoption of any of the three designs referred to, or a modification of them," their Lordships were under the impression that some more matured or modified plans for the works in question would be submitted, when the proper time should arrive; and in reply, I am commanded to state that their Lordships apprehend that the works to which their

Appendix No. 26.

assent is requested could not be safely reckoned upon as adequate to fulfil the object proposed, viz., the making and maintaining a deep-water entrance to the Tyne; and a the question is one of great public importance, their Lordships cannot become responsible for the sanction of the same in the manner proposed, and must therefore withhold assent.

I am, &c.

(Signed) R. OSBORNE.

The Clerk to the
Tyne Improvement Commissioners,
Newcastle-upon-Tyne.

Tyne Improvement Commissioners' Office,
Newcastle-upon-Tyne, March 5, 1853.

SIR,

I HAVE the honour to acknowledge the receipt of your letter of 24th ult.

The limits of deviation (as the Admiralty Inspector observed) are ample for the adoption either of the Parliamentary plan or any improved plan of piers at the mouth of the River Tyne.

The works, as described on the Parliamentary plan, were laid down after a careful investigation, and under able advice, and the Commissioners have since applied to the subject an anxious consideration. The result is, that they are unable to suggest any improvement in the lines laid down on the Parliamentary plan.

The Commissioners confidently rely on the disposition of the Lords of the Admiralty to forward works of such importance to the public, and which, if they had been sooner completed, would have saved many valuable lives; and having this reliance, the Commissioners think their Lordships will not hesitate to state the grounds on which they have come to the conclusion which you communicate, viz., "that the works to which their assent is requested cannot be safely reckoned upon as adequate to fulfil the objects proposed."

I am, &c.

(Signed) JOHN CLAYTON.

To the Secretary of the Admiralty,
London.

Admiralty, April 4, 1853.

SIR,

I HAVE to acknowledge the receipt of your letter of 5th March last, on the subject of the proposed outer piers (at the bar of the River Tyne), and I am commanded by the Lords Commissioners of the Admiralty to state that the subject has received their best consideration, and that, aided by the opinions of two officers of the Navy, well qualified to give an opinion on the subject, their Lordships are under the necessity of adhering to their refusal to assent to the proposed piers, under the powers of the 51st section of the Act of last year.

You observe that the works, as described on the Parliamentary plan, underwent a careful investigation by able advisers, and that the River Tyne Commissioners are unable to suggest any improvement; but it seems necessary here to point out that from the Report of the Admiralty Inspector (under the Preliminary Inquiries Act) of last year, and subsequent to the adoption of the plans to which you now refer, it appeared by the evidence of your engineer, Mr. Brooks; of Mr. Thomas Taylor, Mr. Calvert, Master in the Royal Navy, who had made a recent survey of the Tyne; Mr. Nicholson, C.E., Mr. James Rendel, C.E., whom the Tyne Commissioners had employed at a great expense to report to them, that these gentlemen all held opinions more or less differing from each other; that the plan of the Commissioners, who, it is understood, are not unanimous, and who are neither engineers nor nautical men (with the exception of Captain Purdo), was different from that of their engineer; and lastly, that the plan of their engineer, in 1852, differed very much from his plan of 1832. Under these great differences of opinion, and the very wide limits of deviation set out in the Parliamentary plans, it was very satisfactory to the Admiralty Inspector, and also to their Lordships, that there were such wide limits of deviation left for any plan that might be deemed most suitable.

You invite their Lordships to state the grounds on which they have come to the conclusion, viz., "that the works to which assent is requested cannot be safely reckoned upon as adequate to fulfil the object proposed."

Their Lordships trust that you will readily perceive that any attempt to get into an epistolary discussion on the subject must prove as unsatisfactory as it would be unusual.

The Board are induced to consider the outer piers of vast importance, particularly to North and South Shields, and even to be considered as a national object; and it is quite correct when you observe that the Commissioners may rely on the disposition of the Lords of the Admiralty to forward works of such importance, though it must be no less obvious that any undue haste in carrying out such a measure might have to be deeply repented of; and if want of the desired shelter should be now somewhat delayed, their Lordships can take no blame to themselves, but must rather regret that so important and so definite a measure as now alleged by the Commissioners for the safety and convenience of the shipping of the port should have been allowed to remain so long in abeyance.

I am now to bring to the consideration of the Commissioners that any steps to promote this matter must rest with themselves, as under the Act it does not appear that the Admiralty have any other option than to approve or dissent to the plan transmitted to them.

In conclusion, I have only to state that their Lordships will be happy to entertain any mode of settling the question which the Commissioners may propose.

I am, &c.
(Signed) R. OSBORNE.

John Clayton, Esq.,
Clerk to the River Commissioners,
Newcastle-on-Tyne.

SIR, Newcastle-upon-Tyne, April 18, 1853.

I HAVE the honour to acknowledge the receipt of your letter of 4th instant, on the subject of the proposed piers at the mouth of the River Tyne. I am quite aware of the inconvenience of an epistolary discussion of an engineering question, and yet, if the Lords of the Admiralty merely dissent from the plan proposed without giving the Tyne Improvement Commissioners any hint as to the ground of that dissent, you will perceive that the latter have nothing to guide them in preparing a new plan.

If we are to wait till the engineers agree in opinion, and until the Commissioner themselves shall be unanimous, there will be no limit to the delay which must take place.

The Commissioners have a difficulty in themselves proposing any mode of settling the question; but if the Lords of the Admiralty would approve of the plan being submitted to their inspector, Mr. Walker, I think the probability is, that the Commissioners would feel themselves justified in acquiescing in any alteration in the plan which he might decide upon.

I have, &c.
(Signed) JOHN CLAYTON.

To the Secretary of the Admiralty,
London.

SIR, Admiralty, May 6, 1853.

I HAVE to acknowledge the receipt of your letter of the 18th April instant, wherein you observe that, "if the Lords of the Admiralty would approve of the plan of the works at the entrance of the River Tyne being submitted to their inspector, Mr. Walker, you think the probability is, that the Commissioners would feel themselves justified in acquiescing in any alteration in the plan which he might decide upon.

And I am commanded by their Lordships to acquaint you in reply, that they have long felt the necessity of placing the entire responsibility of the plans for the works at the entrance of the Tyne with an eminent engineer, in whom the public, their Lordships, and the Tyne Commissioners might place confidence; and if the proposal now made be acceded to, it shall be understood that the plans of works, when completed by Mr. Walker, upon his individual responsibility (after taking all necessary evidence), shall be final, and accepted by the River Tyne Commissioners, and not to be deviated from, unless with the concurrence of the Admiralty, and that Mr. Walker be left entirely unfettered, within the limits of deviation of the Act of last year, to select or modify any proposed plan, or to originate any other one, as he shall deem proper, to cover his reponsibility on so grave a question.

In the instructions given to Mr. Walker, he should be called upon to provide for the early removal of the nine-feet bar, by means of dredging, to a depth of not less than 14 feet at time of low-water spring tides, a work which their Lordships must insist upon being executed.

I am, &c.
(Signed) W. A. B. HAMILTON.

John Clayton, Esq.
Clerk to the Tyne Improvement Commissioners,
Newcastle-on-Tyne.

SIR, Admiralty, June 14, 1853.

I AM commanded by the Lords Commissioners of the Admiralty to request your attention to their Lordships' communication of the 6th May last (in reply to your letter of 18th April), in which you are acquainted that their Lordships "have long felt the necessity of placing the entire responsibility of the plans for the works at the entrance of the Tyne with an eminent engineer, in whom the public, their Lordships, and the Tyne Commissioners might place confidence; and if the proposal now made be acceded to, it be understood that the plans of works, when completed by Mr. Walker, upon his individual responsibility (after taking all necessary evidence), shall be final, and accepted by the Tyne Commissioners, and not to be deviated from, unless with the concurrence of the Admiralty, and that Mr. Walker be left entirely unfettered, within the limits of deviation of the Act of last year, to select or modify any proposed plan, or to originate any other one, as he shall deem proper, to cover his responsibility in so grave a question," &c.

Their Lordships having in the letter above quoted, signified their willingness to place the planning of the entire works under the direction of Mr. Walker, I am to request whether the terms mentioned are accepted by the River Tyne Commissioners.

I am, &c.
(Signed) R. OSBORNE.

John Clayton, Esq.,
Secretary to Tyne Commissioners,
Newcastle.

Appendix No. 26.

SIR, Newcastle-upon-Tyne, June 14, 1853.

I HAVE the honour to acknowledge the receipt of your letter of 6th May.

I am authorized by the Tyne Improvement Commissioners to accept the appointment of Mr. Walker, in the terms of that letter, and to assure you that they will readily take such steps as Mr. Walker may direct for the removal of the nine-feet bar to which you refer.

I have, &c.

Captain Hamilton, Admiralty. (Signed) JOHN CLAYTON.

SIR, Admiralty, June 16, 1853.

I AM commanded by the Lords Commissioners of the Admiralty to acknowledge the receipt of your communication of the 14th June instant, in which you state that you are authorized by the Tyne Improvement Commissioners to accept the appointment of Mr. Walker, in the terms of the Admiralty letter of 6th May, and that they will readily take such steps as Mr. Walker may direct for the removal of the nine-feet bar; and in reply, I am to acquaint you that Mr. Walker has been informed that their Lordships require he should receive, on the part of the Admiralty, the evidence of Captain Washington, and Mr. Calver, R.E., and of Captain Vetch, R.E., on the matters to be dealt with, and such other evidence as you may propose, or he may judge necessary, as preliminary to designing the works, which he is to be left entirely unfettered to adopt.

I am, &c.

John Clayton, Esq., Secretary to the Tyne Commissioners, Newcastle. (Signed) W. A. B. HAMILTON.

SIR, Admiralty, June 16, 1853.

I AM commanded by the Lords Commissioners of the Admiralty to acquaint you that the River Tyne Commissioners have accepted the terms made to them in the Admiralty letter of the 29th April last, on the subject of the works at the mouth of the river, a copy of which has been furnished to you, and in which their Lordships stated they were willing to place the entire responsibility of the plans for the works with you, such plans when completed by you, upon your individual responsibility (after taking all necessary evidence), to be final, and accepted by the River Tyne Commissioners, and not to be deviated from, unless with the concurrence of the Admiralty, and that you should be left entirely unfettered, within the limits of deviation of the Act of last year, to select or modify any proposed plan, or to originate any other one, as you should deem proper, to cover your responsibility on so grave a question.

I am further to acquaint you that, it is their Lordships' desire that before maturing your plans you should take the evidence of Captain Washington, R.N., and Mr. Calver, R.N., and also of Captain Vetch, R.E., on the subject, with such other evidence as the Commissioners may suppose, or you may deem necessary, as preliminary to designing the works, which you are left entirely unfettered to adopt.

I am also to state that the Commissioners have expressed their readiness to take such steps as you may direct for the removal of the nine-feet bar.

I am, &c.

James Walker, Esq., C.E., Great George-street, Westminster. (Signed) W. A. B. HAMILTON.

SIR, 23, Great George-street, April 21, 1854.

THE Commissioners of the River Tyne Improvements inform me that they are making arrangements for proceeding with the works of the new piers at the entrance of the river, and that it is necessary they should do so without delay, in order to prevent the lapse of their power. Their Act contains a clause (51), "That previously to commencing the piers or any works under this Act, the Commissioners shall deposit at the Admiralty Office plans, sections, and working drawings of the said plans and works connected therewith, for the approval of the Lord High Admiral of the United Kingdom of Great Britain and Ireland, or the Commissioners for executing the office of Lord High Admiral aforesaid, such approval to be signified in writing under the hand of the Secretary to the Admiralty; and such piers and works shall be constructed only in accordance with such approval."

The plan and sections have been for some time deposited at the Hydrographer's office; and I am desired by the Commissioners to request you to move their Lordships to approve the same, and to let such approval be certified by your signature.

I enclose a print of my report to the Commissioners, which accompanied the plans.

I have, &c.

The Secretary to the Admiralty. (Signed) JAMES WALKER.

Appendix No. 26.

SIR, Newcastle-upon-Tyne, April 22, 1854.

As the Tyne Improvement Commissioners are making arrangements for proceeding with the works of the new piers at the entrance of the river, I beg to refer you to the 51st clause of the "Tyne Improvement Act, 1852," which provides "that previously to commencing the piers or any works under this Act, the Commissioners shall deposit at the Admiralty Office plans, sections, and working drawings of the said piers and works connected therewith, for the approval of the Lord High Admiral of the United Kingdom of Great Britain and Ireland, or the Commissioners for executing the office of Lord High Admiral aforesaid, such approval to be signified in writing under the hand of the Secretary of the Admiralty, and such piers and works shall be constructed only in accordance with such approval."

As the plans and sections of those piers, prepared under the direction of Mr. Walker, the engineer recommended by the Lords of the Admiralty for this purpose, have been for some time deposited at the Hydrographer's Office, I am directed by the Commissioners to request that you will obtain their Lordships' approval of the same, and that such approval may be certified in writing under your hand.

I may add, that as those plans have received the approval of the Commissioners, it is requisite that the works should be immediately commenced with, in order to prevent the lapse of the time limited by the Act for that purpose.

I have, &c.

The Secretary of the Admiralty. (Signed) JOHN CLAYTON.

SIR, Admiralty, May 12, 1854.

I AM commanded by the Lords Commissioners of the Admiralty to acknowledge the receipt of your letter of 22d April, in which you state that the Tyne Improvement Commissioners are making arrangements for proceeding with the works for the proposed piers at the entrance of the river, and in which you refer to the 51st section of the Act of 1852, which enacts, "That previously to commencing the piers, or any works under the Act, the Commissioners shall deposit at the Admiralty Office plans, sections, and working drawings of the said piers and works connected therewith, for the approval of the Lord High Admiral of the United Kingdom of Great Britain and Ireland, or the Commissioners for executing the office of Lord High Admiral aforesaid, such approval to be signified in writing under the hand of the Secretary of the Admiralty, and such piers and works shall be constructed only in accordance with such approval."

You state that the plans and sections of the piers have been for some time deposited at the Hydrographic Office, and request their Lordships' approval thereof; and in reply to such request, I am directed to state that as yet no working plans, properly so called, have been deposited with the Admiralty on which specifications and estimates could be founded, and I am directed by their Lordships to state that, if the Commissioners are in possession of these last, it is desirable they should be forwarded to the Admiralty.

In undertaking so large a work, it seems necessary that detailed estimates should be arrived at, and that borings on the lines of the foundations should be taken, sufficiently numerous to arrive at the quantity of stones likely to be absorbed by the sands, and the cost thereby incurred.

It is also desirable to know how far funds may be forthcoming to carry out the proposed piers and works, and the estimated time for completing the same; and until these particulars have been furnished, their Lordships would not be warranted in sanctioning a work, the cost of which had not been calculated, and the means of completion provided for, and it is the more necessary that this should be carefully and minutely attended to, if the Commissioners have any conception that application will be made to Government to complete a work now proposed to be commenced upon.

I am directed, therefore, to request that the Commissioners will furnish these documents and statement, and in the meantime there seems to be no reason whatsoever why the nine-feet bar should not be immediately removed, it being a work which all parties agree should be accomplished, and which their Lordships have insisted on being done.

I am, &c.

(Signed) W. A. B. HAMILTON.

John Clayton, Esq.,
Secretary to the Tyne Improvement Commissioners,
Newcastle-upon-Tyne.

SIR, 7, Suffolk-street, Pall Mall, May 18, 1854.

I HAVE the honour to acknowledge the receipt of your letter of 12th instant, in reply to my letter of 22d April last, on the subject of the Tyne Piers.

I take the liberty of reminding the Lords Commissioners of the Admiralty that on 6th May 1853, they required of the Tyne Commissioners, who acquiesced in that requirement, "That the plans of works, when completed by Mr. Walker, (who was originally introduced to the Tyne Commissioners as the Admiralty Inspector) should be final, and accepted by the Tyne Commissioners, and not to be deviated from, unless with the concurrence of the Admiralty." That Mr. Walker, after a prolonged and careful examination of evidence, made his report on 15th of November last, in which he laid

Appendix No. 26.

down the plan and section for the erection of the works; and that the Commissioners are bound to execute the works according to that plan and the sections attached to it, unless the Admiralty shall hereafter authorize any deviation.

I have to state, in reply to your letter of the 12th instant, that sufficient borings have been made on the lines of the foundations of the piers, and an enlarged plan, with sections of the works prepared by Mr. Walker, has been deposited in the Hydrographic Office, which plans and sections, as the Tyne Commissioners are assured by Mr. Walker, contain the working plans, so far as they can at present be prepared. The future details must depend on the character of the stone to be procured from quarries which have not yet been explored, and the extent to which the materials may be absorbed in the foundations of the piers, which appear from the borings to be altogether in sand. The same causes prevent any precise estimate being now made, but the Commissioners, forming their judgment on the best information and the best advice they are able to obtain, estimate the cost of completing the works at from 300,000*l.* to 400,000*l.*

With respect to the funds for the execution of these works, I can only say that they have been provided by the Legislature, in the shape of a tonnage rate on shipping frequenting the River Tyne, which commenced from the passing of the Act of 1852. The annual produce of this rate is at present 12,000*l.*, or thereabout, but the rapidly increasing commerce of the Tyne will occasion a considerable augmentation of the annual produce, and the Tyne Commissioners have the power of borrowing at any time 200,000*l.* on security of this rate. They recently made an application to Government, which was not successful, for pecuniary aid in prosecuting the work, not so much from any feeling of the insufficiency of their own funds, but because they conceived it to be just that the nation should contribute to a work not less of national than of local importance. The Legislature has limited the time for the completion of the works to seven years from the passing of the Act, but if that time should be found insufficient, the Commissioners will apply to Parliament for its extension. The nine-feet bar to which you allude, I can venture to say will be removed during the present summer.

In conclusion, I respectfully call the attention of the Lords Commissioners of the Admiralty to the 44th section of the Act, which renders it imperative on the Tyne Commissioners to commence these works on or before the 17th June next; and in the names of the Tyne Improvement Commissioners, I beg that the approval of their Lordships may be given to the plan of the works deposited in the Hydrographic Office.

I have, &c.

W. A. B. Hamilton, Esq.
Admiralty.

(Signed) JOHN CLAYTON.

SIR, Admiralty, May 29, 1854.

I AM commanded by the Lords Commissioners of the Admiralty to acknowledge the receipt of your letter of 18th instant, requesting the Admiralty approval to the plans and sections for piers at the entrance to the River Tyne, and which were lodged at the Hydrographic Department of the Admiralty on or about 12th December last; and in reply thereto, I am directed to observe, that the plans and sections of works alluded to are not understood as the working plans required by the Act, and without any estimate on the part of the Commissioners, the works are considered likely to cost not less than 600,000*l.*, or three times the amount contemplated by the Act: that the approximate estimate mentioned in your letter of 18th instant, viz, from 300,000*l.* to 400,000*l.*, is understood to be in respect to the section of Mr. Brooks, and not to that deposited on 12th December, and for which Mr. Walker is responsible.

In leaving the decision of the case in Mr. Walker's hands, as proposed in your letter of 18th April 1853, their Lordships were under the impression that he would be limited by the Commissioners within the sum contemplated by the Act, or within a reasonable margin thereof, but which does not appear to have been the case.

Their Lordships are, however, desirous to avoid causing any delay or difficulty to be placed in the way of the Tyne Commissioners; and if, in consequence of the unexpected and great cost of the piers proposed by Mr. Walker, they have any deviations to propose' their Lordships will give the same their best consideration; but if they adhere to the deposited plan, the Admiralty can only assent to so much of the works as will come reasonably within the cost, and within the provisions and intentions of the Act, viz., their Lordships will assent to the construction of the North Pier on the section of Mr. Walker, to the extent of 1,400 feet from the shore, and to laying down of so much of the core of the South Pier as shall constitute a rubble-stone dyke up to high-water mark, and to an extent not exceeding 2,800 feet from the shore, and that when the Tyne Commissioners relieve the Admiralty of the difficulty and responsibility of assenting to works without sufficient estimates and funds, their Lordships will assent to the extension of the work.

I am, &c.

John Clayton, Esq.
7, Suffolk-street, Pall Mall.

(Signed) W. A. B. HAMILTON.

Appendix No. 26.

SIR, Newcastle-upon-Tyne, June 8, 1854.

I HAD to-day the opportunity of laying your letter of 29th ultimo before the Tyne Improvement Commissioners, who desire me to acknowledge its receipt, and to express their entire approval of the course of proceeding which the Lords of the Admiralty have prescribed, to which they, the Commissioners, will strictly adhere.

They have fixed Thursday next for laying the first stone of each pier.

I have, &c.

W. A. B. Hamilton, Esq., Secretary, London. (Signed) JOHN CLAYTON.

MY LORDS, Newcastle-upon-Tyne, January 18, 1855.

BY the direction of the Tyne Improvement Commissioners, I have the honour to submit for your Lordships' approval the working drawings and specifications for 500 feet in length of the North Pier, and for 2,800 feet in length of the core of the South Pier, which have been already delivered at the Admiralty by Mr. Clay and Mr. Robinson, two of the Commissioners.

I shall be glad to receive an early communication of their Lordships' assent to these working drawings and specifications.

I have, &c.

To the Lords of the Admiralty. (Signed) JOHN CLAYTON.

SIR, Admiralty, January 22, 1855.

I HAVE to acknowledge the receipt of your letter of 18th January, in which you request their Lordships' assent to working plans for the North and South piers at the mouth of the Tyne, left at the Harbour Department by Messrs. Clay and Robinson, two of the Commissioners, and in reply thereto, I am commanded to state that their Lordships have given full consideration to the subject, and regret to find that considerable difficulty has arisen in the matter.

The Tyne Commissioners must be fully aware that after great variance of opinion, it was proposed that the plans of the piers should be referred to an engineer of standing, in whom their Lordships, the Tyne Commissioners, and the public might place full confidence, and who should take the entire responsibility of his own recommendation, as the best guarantee for obtaining a well-devised plan of the structures. The Tyne Commissioners proposed Mr. Walker to be the engineer selected, in which proposal their Lordships concurred.

On the 15th November 1853, Mr. Walker forwarded his report on the case, with two plans, one showing the outline of the North and South Piers which he proposed, and the other profiles of the North and South Piers to scale.

Their Lordships saw the difficulty of assenting to the entirety of plans of such vast extent as those proposed by Mr. Walker, and for the execution of which there were no adequate funds; but in order that no time should be lost, their Lordships stated their readiness to assent to the construction of 1,400 feet of the North Pier, on the section of Mr. Walker, and to laying down 2,800 feet of rubble-stone hearting, or core, of the South Pier, across the Herd Sand; but their Lordships perceive that the working plan of the North Pier, as lately left at the Admiralty for assent, is not in conformity with the profile of Mr. Walker, and that the cross sections of the South Pier do not show merely the core of that breakwater, but a finished section of the work; and their Lordships regret that they see no reason to alter their decision of 29th May 1854 in this particular.

I am further directed to recall your attention to the basis of the agreement, that by the employment of an engineer of great standing in his profession, it was intended to throw the whole responsibility of the work on him, as a guarantee to all other parties interested, and that his skill and judgment should not be confined to the mere outline of the piers, but be equally applied to the construction, viz., that Mr. Walker should be responsible for the working plans, the description of material used, and the specification of work and its execution.

Their Lordships do not perceive that Mr. Walker has been consulted, or has approved of the works for which the Admiralty assent is now asked; but unless that be the case, Mr. Walker's responsibility in his own plans will be entirely lost, and there will be no guarantee to the Lords Commissioners of the Admiralty, or to the general interests of the Tyne, that the work will be successfully carried out, or, in case of failure of the work, where the responsibility would rest.

Their Lordships therefore trust that the engineer who designed the works will be enabled to see them carried out on the details which he conceives necessary to their success and safety.

I am, &c.

John Clayton, Esq., (Signed) W. A. B. HAMILTON.
Clerk to the River Tyne Improvement
Commissioners, Newcastle-upon-Tyne.

Appendix No. 26.

SIR, Newcastle-upon Tyne, February 5, 1855.

I AM directed in the names of the Tyne Improvement Commissioners to acknowledge the receipt of your letter of 22d ult.

If the Lords of the Admiralty will be pleased to refer to my letter of 18th April 1853, and their Lordships' reply of 6th May 1853, and to my letter of 14th June following, their Lordships will find that the reference to Mr. Walker was confined to the settlement of the plans of the piers, and had no connexion with the execution of the works, and that the engagement of the Commissioners, founded on that correspondence, was concluded by Mr. Walker's report of 15th November 1853.

The Commissioners would gladly avail themselves of the assistance of Mr. Walker in the execution of the works, in case they find they can do so on a satisfactory footing, but they must assert their right to appoint such engineers as they see fit to carry out the plans agreed upon; this the Commissioners feel themselves bound to do, but with all possible respect towards the Lords of the Admiralty.

The Tyne Improvement Act, 1852, section 51, provides that the Tyne Improvement Commissioners shall deposit at the Admiralty Office plans, sections, and working drawings of the piers for the approval of the Lords of the Admiralty.

The Commissioners have discharged their duty by depositing in the Admiralty Office plans, working drawings, and sections of 500 feet of the North Pier, and of 2,800 feet of the core of the South Pier (withdrawing the finished section of the South Pier), and they respectfully ask of their Lordships to signify their approval of the same, or if they disapprove, to state the grounds of such disapprobation.

I have, &c.
(Signed) JOHN CLAYTON.

W. A. B. Hamilton, Esq.,
Admiralty Office, London.

SIR, Admiralty, February 8, 1855.

I HAVE to acknowledge the receipt of your letter of 5th instant, in answer to their Lordships' letter of the 22d January, on the subject of the piers at the mouth of the Tyne, in which you request their Lordships' reference to your letter of 18th April 1853, their Lordships' reply of 6th May, and your letter of 14th June 1853, from which you arrive at the conclusion,—first, that the settlement of the plans of the piers had no connexion with the execution of the works; secondly, that the engagement of the Commissioners (founded on that correspondence) was concluded by the delivery of Mr. Walker's report of 15th November 1853.

Their Lordships are quite willing to admit that the engagement with the Tyne Commissioners did not include the execution of the works, and their Lordships, in their letter of 22d ultimo, only drew attention to that point as a desirable guarantee to all parties interested, that the works be carried into execution by the author of the scheme, who it is proposed to make responsible to the country for a successful measure.

Their Lordships are, however, distinctly at issue with the River Tyne Commissioners, "that their engagement was concluded when Mr. Walker delivered his report of 15th November 1853." That report has reference to the mere outlines of piers at the mouth of the Tyne, which constituted a necessary, but quite an elementary, step in the undertaking.

Any person may draw outline piers, but talent and professional skill are most required in devising and describing the means by which such outline works may be carried out to a successful conclusion, and of a permanent stability.

In their Lordships' letter of 6th May 1853, it is stated, "that their Lordships have long felt the necessity of placing the entire responsibility of the plans for the works at the entrance of the Tyne with an eminent engineer." This is obviously synonymous with the responsibility of the entire plans; and subsequently, in the same letter, it is stated, "it should be understood that the plans of works, when completed by Mr. Walker upon his individual responsibility," &c., &c. But the entire plans have not yet been made nor completed by Mr. Walker, what he has proposed being mere outlines of foundation for the building he proposes to erect; and that he is prepared to make plans and specifications for the structures, when called upon, is manifest, as he never could have recommended an outline of piers, the means of conducting which to a successful termination he had not fully satisfied himself of, and on which he was not prepared to stake his professional reputation; but the Tyne Commissioners seem to be of a different opinion, and that any engineer might be called upon to build his own details upon Mr. Walker's foundations; but should their Lordships for sake of argument adopt this view of the case, the 51st clause of the Act requires plans, sections, and working drawings of the said piers and works connected therewith, to be subject to the approval of the Admiralty. Such plans prepared by another engineer were left by Mr. Clay, one of the Tyne Commissioners, at the Harbour Department of the Admiralty, in the middle of January last, and if the engagement, as regards Mr. Walker, be considered at an end, their Lordships have now to decide on the detailed

drawings, under the terms of the Act; and I am directed to state that their Lordships regret they cannot approve of the detailed plans left by Mr. Clay for their Lordships' assent, a position which revives the old question of "who is to decide?" and the necessity of again appointing an engineer in whom their Lordships, the Tyne Commissioners, and the public may place confidence. Appendix No. 26.

Plans and specifications herewith returned.

In conclusion, I am directed to state that their Lordships do not consider Mr. Walker has completed his plans of works; and they earnestly recommend that he be called upon to do so, with such ample descriptions and specifications, as will allow no mistake to arise as to the construction of the works, and as will enable him to retain the responsibility.

I am, &c.
(Signed) W. A. B. Hamilton.

John Clayton, Esq.,
Clerk to the Tyne Improvement Commissioners,
Newcastle-upon-Tyne.

Sir, Newcastle-upon-Tyne, February 22, 1855.

In reply to your letter of the 8th instant, and for the information of the Lords of the Admiralty, I have the satisfaction to state that the Tyne Improvement Commissioners have now concluded an arrangement with Mr. Walker, not only for the preparation by him of the detailed plans for working drawings, and specifications for the piers, but also for the execution of the works on his responsibility.

The detailed plans, working drawings, and specifications of 2,800 feet of the core of the South Pier, and of 1,403 feet of the North Pier, will be submitted to you by Mr. Walker.

I have, &c.
(Signed) John Clayton.

W. A. B. Hamilton, Esq., &c. &c.
Admiralty, London.

No. 27.

Appendix No. 27.

Calculation of the Capacity of the Basin of the River Tyne, between the ancient Shores of the River and the Lines of River Walls now executed or in progress of execution upon the Plan of Mr. W. A. Brooks, the Engineer to the Tyne Improvement Commission, the same being estimated from the extreme Level of the River at Low Water of Spring Tides, and the datum Line of High Water of Spring Tides.

North and South Sides - - -	4,349,195 cubic yards.
Northumberland Docks, and Works connected therewith	1,037,690 cubic yards.
	5,386,885 cubic yards.

(Signed) W. A. Brooks.

No. 28.

Appendix No. 28.

Letter from R. Osborne, Esq., to Joseph Cowen, Esq.

Sir, Admiralty, August 14, 1854.

I am commanded by the Lords Commissioners of the Admiralty to acknowledge the receipt of your letter of 20th July, addressed to Sir James Graham, commenting on a letter to the Admiralty from six of the Tyne Improvement Commissioners: to which I am directed to reply that their Lordships fully recognize the rights of those Commissioners to address the Admiralty, if they consider it necessary to do so; but their Lordships decline entering into any controversy with you on the several statements that you have thought proper to make, being satisfied that the Commission which is about to be appointed by Her Majesty will ascertain the truth, and will determine on the right course to be pursued.

I am, &c.
(Signed) R. Osborne.

Joseph Cowen, Esq.,
Chairman of the River Tyne Commissioners,
Newcastle-upon-Tyne.

Appendix No. 29.

No. 29.

COMPARATIVE STATEMENT showing the Areas at High Water, and the Cubic Capacity of the River Tyne at High and Low Water, as computed from Surveys made in the years 1813, 1849, and 1854.

The quantities computed appear in a line with their respective dates.

The levels of low water and high water for these surveys are those adopted by Mr. Rennie in 1813. High water being level with the notch cut in the low lighthouse at North Shields, which is ascertained to be the level of a good spring tide.

The survey of 1813 was made by Messrs. Giles and Comrie for the late Mr. Rennie, C.E.; that of 1849 by Mr. Comrie for Mr. Rendel, C.E., and verified by the Admiralty Survey of Mr. Calver, R.N., during the same year.

The survey of 1854, by Mr. Comrie, was a re-examination of that of 1849 (each section being closely sounded), by direction of the Tyne Improvement Commissioners; a partial examination by the Admiralty Surveyor, Mr. Calver, R.N., verified Mr. Comrie's labours.

The results of the computations for the years 1813 and 1849 are from calculations made by Mr. Heppel for Mr. Rendel, C.E., based on the foregoing surveys, as given in Nos. 8, 9, and 10 of the plans and papers forming Appendix to Mr Rendel's report of 11th October 1851* to the Tyne Improvement Commissioners.

The computations for the survey of 1854 were made by the directions of Her Majesty's Commissioners for the present inquiry, on the plan adopted by Mr. Heppel, to afford the more perfect comparison, and based on the re-examination of Mr. Comrie in 1854.

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* An analysis in Appendix No. 10. by Mr. Heppel differs in its quantities from results obtained by the abstracting each section and grouping them in a different order; in the accompanying Comparative Statement the sections for the three epochs have been abstracted and grouped for a final comparison under the same conditions.

COMPARATIVE STATEMENT showing the Areas at High Water, and the Cubic Capacity of the River TYNE at High Water and Low Water, as computed from Surveys made in 1813, 1849, and 1854.

LOCALITY.	No. of Section according to Messrs. Heppel and Calver.	Letter of included Sections.	Years.	Area of River below High Water of (15 Feet) Spring Tides.					Cubic Capacity (*in Feet*) of River below Low Water (15 Feet) Spring Tides.				Cubic Capacity (*in Feet*) of River between Low Water and High Water (15 Feet) Spring Tides.			
				Superficial Areas.	Increase.	Decrease.	Per Cent.		Cubic Capacity.	Increase.	Decrease.	Per Cent.	Cubic Capacity.	Increase.	Decrease.	Per Cent.
				Sq. Feet. Impl. Acres.	Sq. Ft. Impl. Acres.	Sq. Ft. Impl. Acres.			Feet.	Feet.	Feet.		Feet.	Feet.	Feet.	
From Newcastle Bridge to Leas Main Staith	1/285 to 29/257	A	1813	1,958,255 = 44·95	— —	— —			8,614,353				20,896,587			
			1849	1,720,653 = 39·26	— —	237,602 = 5·45	13·80		9,745,822	1,131,469	—	13·13	19,413,291	—	1,483,296	7·64
			1854	1,684,682 = 38·67	— —	35,971 = 0·82	2·13		10,449,222	703,400	—	7·21	18,935,041	—	478,250	2·51
From Leas Main Staith to Hall's Timber Yard	29/257 to 37/249	B	1813	588,205 = 13·50	— —				2,315,791				6,455,734			
			1849	573,041 = 13·15	— —	15,164 = 0·35	2·64		2,629,497	313,706	—	13·54	6,363,977	—	91,757	1·44
			1854	548,866 = 12·60	— —	24,175 = 0·55	4·40		2,506,211	—	123,286	4·91	6,149,803	—	214,174	3·48
From Hall's timber yard to One and Half Mile Station	37/249 to 52/234	C	1813	1,476,070 = 33·88	— —				4,928,148				16,483,972			
			1849	1,295,268 = 29·73	— —	180,802 = 4·15	13·95		5,515,835	587,687	—	11·92	15,065,174	—	1,418,798	9·41
			1854	1,295,268 = 29·73	— —	— —			4,916,388	—	599,447	12·11	14,132,067	—	933,107	6·60
From One and Half Mile Station to west end of Dent's Hole	52/234 to 59/227	D	1813	638,004 = 14·64	— —				2,797,560				7,066,141			
			1849	617,564 = 14·17	— —	20,440 = 0·46	3·31		2,816,531	18,971	—	0·67	7,010,228	—	55,913	0·79
			1854	617,564 = 14·17	— —	— —			2,594,103	—	222,428	8·57	6,681,350	—	328,878	4·92
From west end of Dent's Hole to Lock, Blackett, and Co.'s Lead Works	59/227 to 82/204	E	1813	2,017,925 = 46·32					10,437,701				22,453,289			
			1849	2,030,094 = 46·60	12,169 = 0·27	— —	0·60		10,429,919	—	7,782	0·07	22,515,609	62,320	—	0 27
			1854	2,009,009 = 46·12	— —	21,085 = 0·48	1·04		10,726,285	296,366	—	2·83	21,943,799	—	571,810	2·60
From Locke, Blackett, and Co.'s lead works to ship-building yard, St. Anthony's Reach	82/204 to 91/195	F	1813	849,475 = 19·50					5,017,044				9,593,965			
			1849	858,531 = 19·70	9,056 = 0·32	— —	1·06		4,763,358	—	253,686	5·32	9,633,018	39,053	—	0·40
			1854	842,641 = 19·34	— —	15,890 = 0·36	1·88		5,202,899	439,541	—	9·22	9,692,330	59,312	—	0·61
From ship-building yard, St. Anthony's Reach, to first jetty west of Bill Point	91/195 to 102/184	G	1813	1,098,910 = 25·20					5,303,834				12,990,663			
			1849	1,100,715 = 25·26	1,805 = 0·04	— —	0·17		5,333,918	30,084	—	0·56	12,909,940	—	80,723	0·62
			1854	1,100,715 = 25·26	— —	— —			5,735,588	401,670	—	7·53	12,391,185	—	518,755	4·18
From jetty west of Bill Point to about 100 yards east of Bill Point	102/184 to 111/175	H	1813	744,083 = 17·08					5,303,251				8,642,818			
			1849	778,697 = 17·87	34,614 = 0·79	— —	4·65		4,473,568	—	1,029,683	23·01	8,341,963	—	300,855	3·60
			1854	778,697 = 17·87	— —	— —			3,895,220	—	578,348	14·84	8,294,505	—	47,458	0·57
Totals			1813	9,370,927					44,917,682				104,583,169			
			1849	8,974,563					45,708,448				101,253,200			
			1854	8,877,442					46,025,916				98,220,080			

Comparative Statement showing the Areas at High Water, and the Cubic Capacity of the River Tyne at High Water and Low Water, &c.—*continued.*

Locality.	No. of Section according to Messrs. Heppel and Calver.	Letter of included Sections.	Years.	Area of River below High Water of (15 Feet) Spring Tides.						Cubic Capacity (*in Feet*) of River below Low Water (15 Feet) Spring Tides.				Cubic Capacity (*in Feet*) of River between Low Water and High Water (15 Feet) Spring Tides.			
				Superficial Areas.		Increase.		Decrease.		Per Cent.	Cubic Capacity.	Increase.	Decrease.	Per Cent.	Cubic Capacity.	Increase.	Decrease.	Per Cent.
				Sq. Feet.	Impl. Acres	Sq. Ft.	Impl. Acres.	Sq. Feet.	Impl. Acres.									
From 100 yards east of Bill Point to east end of Stormont and Urpeth Staiths - -	111/175 to 126/160	I	1813	2,550,624	= 58·55	—	—	835,459	12·20	48·71	7,594,682	153,202	—	2·01	19,875,300	—	350,167	1·79
			1849	1,715,165	= 39·37	—	—	37,920	0·87	2·26	7,747,884	710,044	—	9·16	19,525,193	—	586,336	3·00
			1854	1,677,245	= 38·50						8,457,928				18,938,857			
From east end of Stormont and Urpeth Staiths to about 100 yards east of R. police station near Low Walker New Quay - - -	126/160 to 140/146	J	1813	2,885,081	= 66·23	—	—	51,593	1·18	1·82	6,382,529	718,433	—	11·25	32,803,268	523,872	—	1·59
			1849	2,833,488	= 65·02	—	—	496,325	11·39	21·23	7,100,962	1,447,679	—	20·38	33,327,140	—	8,433,820	33·89
			1854	2,337,163	= 53·65						8,548,641				24,893,320			
From R. police station to a point near Gosforth and Coxlodge Staiths - - -	140/146 to 150/136	K	1813	2,348,080	= 53·90	—	—	419,641	9·63	21·76	5,285,503	647,448	—	12·06	27,304,622	—	3,938,664	16·85
			1849	1,928,439	= 44·27	—	—	2,000	0·04	0·10	5,932,951	847,040	—	14·26	23,365,958	—	455,781	1·98
			1854	1,926,439	= 44·20						6,779,991				22,910,177			
From near Gosforth and Coxlodge Staiths to Black Staith, Hebburn - - -	150/136 to 176/109	L	1813	9,200,959	= 211·20	—	—	93,404	2·17	1·02	17,525,619	473,416	—	2·70	98,713,141	—	5,196,360	5·55
			1849	9,107,555	= 209·08	—	—	675,957	15·52	8·02	17,999,035	723,869	—	4·02	93,516,781	—	7,796,211	9·06
			1854	8,431,598	= 193·56						18,722,904				85,720,570			
From Black Staith, Hebburn, to Kibbleworth Staith, Jarrow -	176/103 to 201/84	M	1813	7,621,161	= 177·02	—	—	649,456	10·31	9·31	19,703,133	4,541,551	—	23·04	87,438,341	—	8,583,115	10·80
			1849	6,971,705	= 160·04	—	—	726,572	16·67	11·63	24,244,684	—	2,243,864	10·20	78,855,226	—	8,613,434	12·26
			1854	6,245,133	= 143·37						22,000,820				70,241,792			
From Kibblesworth Staith, Jarrow, to the east end of Jarrow Quay - - -	201/84 to 213/72	N	1813	3,536,975	= 81·19	—	—	86,717	1·99	2·51	10,971,638	1,618,002	—	14·75	43,583,841	—	940,691	2·20
			1849	3,450,258	= 79·20	—	—	77,902	1·80	2·31	12,589,640	43,073	—	0·34	42,643,150	—	205,242	0·48
			1854	3,372,356	= 77·44						12,632,713				42,437,908			
From the east end of Jarrow Quay to Hay Hole (*excluding Jarrow Slake*) - - -	213/72 to 223/62	O	1813	3,659,432	= 84·00	3,853	= 0·08	—	—	0·01	8,420,800	2,780,062	—	33·01	45,235,473	—	34,560	0·07
			1849	3,663,285	= 84·09	—	—	—	—	—	11,200,962	—	717,954	6·84	45,200,918	—	901,810	2·03
			1854	3,663,285	= 84·09						10,482,908				44,299,108			
From Hay Hole to the west corner of Young's New high dock, South Shields (*excluding Jarrow Slake*) - - -	223/62 to 237/48	P	1813	4,748,381	= 109·00	—	—	96,558	2·21	2·07	16,734,501	—	355,663	2·17	60,860,804	—	1,338,626	2·25
			1849	4,651,823	= 106·79	—	—	247,715	5·68	5·62	16,378,838	—	1,080,530	7·06	59,522,178	—	4,485,868	2·15
			1854	4,404,108	= 101·33						15,298,308				55,036,310			
Folio 2. Totals - - - -			1813	36,550,693							92,618,405				415,814,795			
			1849	34,321,718							103,194,856				395,956,544			
			1854	32,057,327							102,924,213				364,478,042			

Comparative Statement showing the Areas at High Water, and the Cubic Capacity of the River Tyne at High Water and Low Water, &c.—*continued.*

Locality.	No. of Section according to Messrs. Heppel and Calver.	Letter of included Sections.	Years.	Area of River below High Water of (15 Feet) Spring Tides.					Cubic Capacity (*in Feet*) of River below Low Water (15 Feet) Spring Tides.				Cubic Capacity (*in Feet*) of River between Low Water and High Water (15 Feet) Spring Tides.			
				Superficial Areas.	Increase.	Decrease.		Per Cent.	Cubic Capacity.	Increase.	Decrease.	Per Cent.	Cubic Capacity.	Increase.	Decrease.	Per Cent.
				Sq. Feet. Impl. Acres.	Sq. Ft. Impl. Acres.	Sq. Feet.	Impl. Acres.		Feet.	Feet.	Feet.		Feet.	Feet.	Feet.	
From Young's New High Dock, South Shields, to White Hill Point	237/48 to 245/40	Q	1813	1,798,693 = 41·60	21,404=0.49	—	—	1·07	10,753,882	125,745	—	1·16	21,314,883	843,496	—	3·96
			1849	1,820,097 = 41·78	— —			1·14	10,879,627	444,257	—	4·08	22,158,379	—	84,950	0·38
			1854	1,794,500 = 41·19		25,597 =	0·58		11,323,884				22,073,429			
From White Hill Point to Laing's Dock, North Shields	245/40 to 264/27	R	1813	5,296,753 = 121·59	— —	112,150 =	2·57	2·16	28,190,371	7,208,984	—	25·57	67,335,056	583,363	—	0·86
			1849	5,184,603 = 119·02	— —	7,717 =	0·17	0·14	35,399,355	—	1,134,457	3·31	67,918,419	829,246	—	1·22
			1854	5,176,886 = 118·84					34,264,898				68,747,665			
From Laing's Dock, North Shields, to Low Light Tide Gauge, North Shields	264/21 to 281/3	S	1813	3,360,045 = 77·13	— —	208,348 =	4·78	6·60	28,387,149	442,483	—	1·55	46,098,421	—	879,202	1·94
			1849	3,151,697 = 72·35	— —	5,445 =	0·12	1·73	28,829,632	1,599,273	—	5·54	45,219,219	858,909	—	1·98
			1854	3,146,252 = 72·22					30,428,905				46,078,128			
Abstract of Folio 3			1813	10,455,491 —	— —	—	—	—	67,331,402	—	—	—	134,748,360	—	—	—
			1849	10,156,397 —	— —	—	—	—	75,108,614	—	—	—	135,296,017	—	—	—
			1854	10,117,636 —	— —	—	—	—	76,017,687	—	—	—	136,899,222	—	—	—
Ditto	2		1813	36,550,693 —	— —	—	—	—	92,618,405	—	—	—	415,814,795	—	—	—
			1849	34,321,718 —	— —	—	—	—	103,194,856	—	—	—	395,956,544	—	—	—
			1854	32,057,327 —	— —	—	—	—	102,924,213	—	—	—	364,478,042	—	—	—
Ditto	1		1813	9,370,927 —	— —	—	—	—	44,917,682	—	—	—	104,583,169	—	—	—
			1849	8,974,563 —	— —	—	—	—	45,708,448	—	—	—	101,253,200	—	—	—
			1854	8,877,442 —	— —	—	—	—	46,025,916	—	—	—	98,220,080	—	—	—
Totals (*excluding Jarrow Slake*)								Per Annum.								
			1813	56,377,111=1294·24	— —			1·86	204,867,489	19,144,429	—	9·34	655,146,324	—	22,640,563	3·57
			1849	53,452,678=1227·10	— —	2,924,433 =	67·10	11·03	224,011,918	955,898	—	0·42	632,505,761	—	32,908,417	5·49
			1854	51,052,407=1172·23	— —	2,400,271 =	55·10		224,967,816				599,597,344			

Total - Cubic Capacity of River (*at 15 feet Spring Tide*) in feet			Decrease.	Per Cent.
	1813	860,013,813	—	—
	1849	856,517,679	— 3,496,134	— 0·40
	1854	824,565,160	— 31,952,519	— 3·87

Results of 14 Sections extending from the Low Light Tide Gauge at Shields, to Prior Stone, (*computed only for Low Water, 15 feet Spring Tides*) -					Per Cent.				Increase.	Per Cent.
Superficial Area at Low Water.	1813	1,813,924	—	—	—	Cubic Capacity in feet below Low Water -	1813	14,668,153	—	—
	1849	1,923,299	—	109,375 Increase.	6·03		1849	16,525,794	— 1,857,641	12·66
	1854	1,900,657	—	22,642 Decrease.	1·19		1854	18,018,379	— 1,492,585	9·00

3 U 3

Appendix No. 30.

No. 30.

List of Plans of the River Tyne, and Documents connected therewith, produced for the Information of Her Majesty's Commissioners, during the Inquiry.

1771. MS. plan of the River Tyne, with soundings, dated 23d November 1771; by John Fryer. Scale 20 chains to an inch.

1773. Engraved plan of the lower part of the River Tyne, from west end of Jarrow Bight to the Bar; by John Fryer. Scale 4 chains to the inch.

1782. MS. plan of the River Tyne, from Tynemouth Bar to Hedwin Streams, being the part which is affected by the tide, and of which the mayor and corporation of Newcastle are conservators; by John Fryer. Scale 8 chains to the inch.

1787. MS. plan of the River Tyne from the Bar to the head of South Shields. Scale 4 chains to the inch.

1813. Original MS. plan of the Tyne, surveyed and drawn by Francis Giles in 1813, under directions of John Rennie; showing the soundings at high and low water. Scale 2 chains to an inch.

A reduced copy of the above plan, to accompany Mr. Rennie's report of 1816, showing his proposed improvements.

Sections of tides observed at Shields, Hebburn Quay, and Newcastle, observed by Messrs. Giles and Comrie, between 27th March and 3d August 1813, referred to in Mr. Rennie's report.

Table of rate of current on flood and ebb tide, observed in River Tyne, from Newcastle Bridge to Shields Point, by Giles and Comrie, same period.

1842. A reduced copy of Giles's plan of the Tyne, on a scale of 6 chains to an inch, showing the river lines proposed by Mr. Brooks, C.E., engineer to the corporation; referred to in his report, January 16, 1848.

1844. Plan for improvements in the River Tyne, between Newcastle Bridge and South Shields; 2 sheets. Scale 2 chains to an inch. By Mr. Brooks, C.E., engineer to the corporation.

1848. Tidal diagrams, between Ryton and the Sea. 4 sheets.

1849. } Plans and papers forming Appendix to Mr. Rendel's report of 11th October
1854. } 1851. Dated 30th Jan. 1852.

I. Mr. Comrie's originally plotted plan from Newcastle Bridge to Tynemouth Bar, made in the year 1849. In five separate sheets.

This plan has marked on it lines of soundings corresponding with those on Mr. Rennie's plan of 1813, showing the various changes in the boundaries of high water, and in the depths and positions of the channels of the river that have taken place in the interval. It also contains, in black and red figures, the levels of the several quays on the whole line of river frontage, as well as the levels of the bed of the river at the foot of the said quays.

Note.—These plans have also introduced on them the soundings (marked in red) taken by Mr. Comrie in 1854, by the direction of the Tyne Improvement Commissioners.

II. Tidal diagrams of the flow and ebb of spring and neap tides, plotted from observations taken in 1849 by Mr. Comrie, as deduced from gauges fixed at Tynemouth Haven, Priors Stone, Low Light, Ballast Office, White Hill Point, Dentshole, Ouse Burn, and Newcastle Old Quay. Book containing six sheets.

III. Set of plans of the entrance to the harbour, representing the course of the tidal currents during various hours of ebb and flood, with reference to the lines of the proposed piers. Book containing nine sheets. The currents are those observed by Mr. Giles in 1813.

IV. Plan of Jarrow Slake, with soundings taken by Mr. Giles in 1813, repeated by him in 1835, and again by Mr. Comrie in 1849. One sheet.

V. Plan of the mouth of the River Tyne, showing section and borings on the line of pier, over the Herd Sand, as proposed by the late Mr. Rennie in 1816; the borings by Mr. Giles in 1835. One sheet.

VI. Plan of the mouth of Tyne and the Bar, with relative soundings taken in 1813 and 1835 by the late Mr. Giles. One sheet. (Nos. IV. V. VI. were obtained from Mr. Alfred Giles for Mr. Rendel's inquiry, as sanctioned by Mr. Clayton.)

VII. Mr. Heppel's plotted sections of the river from the Narrows to Newcastle Bridge, as laid down from the soundings given on Mr. Giles's (Rennie's) plan of 1813, from Mr. Comrie's plan of 1849, and from Mr. Calver's plan, also of 1849. A book containing 285 sections, with relative lines of soundings from each of the above-named surveys.

VIII. Detail of calculations of high and low water contents, and high water superficial area, as computed by Mr. Heppel from Mr. Giles's (Rennie's) survey of 1813. One book containing 96 sheets.

IX. Detail of calculations of high and low water capacities, and high water area, as computed by Mr. Heppel from Mr. Comrie's survey of 1849. One book containing 145 sheets.

X. Abstract of calculations of high and low water capacities, and high water areas of the River Tyne, between Newcastle-bridge and "the Narrows," from the surveys of 1813, by Giles, and 1848, by Comrie, with abstract comparative statement of results by Mr. Heppel. A book containing 25 sheets.

XI. Investigation to reconcile differences in the computation of Mr. Calver, as to the decrease of cubic capacity and area of the river between Newcastle Bridge and the Narrows, as made up from Mr. Giles's survey of 1813, Mr. Comrie's survey of 1849, and Mr. Calver's survey of same date, in the form of a report by Mr. Heppel, dated February 13, 1851, with sections illustrating the same, as taken from the several surveys before referred to. A book containing report of 6 pages; tables of calculations, 23 sheets; and 2 sheets of sections.

XII. Tables and diagrams, as made up from calculations, to determine the approximate height and width between the half-tide banks for the proper training of the river, with report by Mr. Heppel explanatory of the same, as ordered by Mr. Rendel, for reference in determining the proper works for the improvement of the river between Newcastle Bridge and Howden. A book containing a report, pp. 11; table of calculations, 1 sheet; diagrams 5 sheets.

XIII. Diagram representing the position of the proposed half-tide banks on each line of cross section between Newcastle Bridge and White Hill Point, to determine the approximate quantity of work requisite for training the river. A book containing 24 sheets.

XIV. A book containing commercial survey of the banks of the river, by Mr. Marcus W. T. Scott, made in the year 1849, ordered by Mr. Rendel for his use in determining to what extent, if any, the proposed half-tide walls for improvement of river would affect the property, and to guide him in designing the works generally.

1849. Plan of River Tyne from Newcastle Bridge to its outfall, showing the works proposed by J. M. Rendel, Esq., C.E., for improving its navigable channel and sea entrance, and referred to in his report of November 11, 1851. From a survey by Mr. Comrie, 1849. Scale 4 chains to the inch.

Plan of the River Tyne from Newcastle Bridge to Hedwin Streams, engraved from a survey by Mr. Wm. Brooks, C.E., in 1849. Scale 2 chains to the inch.

An engraved copy of Messrs. Rendel and Brook's plans and works for the improvement of the navigation of the Tyne from Hedwin Streams to the Bar, 1851 (with additions to 1854).

M.S. tidal observations made by Mr. Comrie for Mr. Rendel in 1849—6 sheets.

1850. Plans for piers at entrance, by various authorities.

1852. Longitudinal sections of river Tyne from Newcastle Bridge to Hayhill Point by W. A. Brooks, Esq., C.E., 4 sheets; comparative with Rennie in 1813 and Mr. Comrie in 1849.

1852–3. Nine sheets of soundings made by Mr. Brooks, C.E., for Tyne Improvement Commission in various parts of the River Tyne.

Plan of Messrs. Palmer's application to Tyne Improvement Commissioners. Scale 10 chains to an inch. By J. Bell.

Mr. Leslie's plan of first application. Scale 3 chains to an inch.

Mr. Leslie's plan of second application, 17th April 1853.

Plan and section of piers by James Walker, Esq., C.E.

Furnished by the Hydrographic Office, Admiralty.

1838. MS. plan of the entrance and approach to the River Tyne, by Commander Slater and Mr. E. K. Calver, R.N., 1838. Scale 12 inches nearly to the nautic mile.

1849. MS. plan of the River Tyne from the sea to Newcastle Bridge, by E. K. Calver, Esq. Master R.N. (between June and December). Scale 27 inches nearly to nautic mile.

This plan is accompanied by a book containing a comparison of the respective breadths, depths, and lengths of the channels, the superficial extent of the high and low water surfaces, the amount of tidal water admitted, &c., in the years 1813 and 1849.

1850. MS. plan of River Tyne from Newcastle Bridge to Hedwin Streams, by E. K. Calver, Esq., Master R.N. Scale 27 inches nearly to the nautic mile.

1854. Tracing of partial examination of the River Tyne, by E. K. Calver, Esq., R.N.

REDUCED
CHART
OF THE
RIVER TYNE
BETWEEN NEWCASTLE & TYNEMOUTH BAR,
1854.
NOTE.— This survey was made by the late Mr A.Comrie in the Autumn of 1854, to test the condition of the navigation with its state when surveyed by Messrs Giles and Comrie in 1813, and by himself in 1849.
The Soundings are expressed in feet at High Water of a good Spring Tide.— being level with the notch cut in the Low Lighthouse at North Shields.
Recently made land is shewn by a slight shading.
(Reduced by W.A. Brooks Esqre C.E. from the Original Survey.)
ST LAWRENCE
Halls Timber Yard
TYNE MAIN
ST PETER'S QUAY
St Peters Dock Yard
FRIARS GOOSE POINT
Ferry
Grain Elles
Old Boiling House
Locke, Blackett & Co's White Lead Works
Grindstone Wharf
ST ANTHONY POINT
ST ANTHONY'S QUAY
HEWORTH SHORE
BILL POINT
WALKER IRON WORKS
WINCOMBE LEA
Corporation Magazine
LOW WALKER
WALKER NEW QUAY
WALKER SAND
Walker New Staiths
New Ballast Jetty
HEBBURN QUAY
WALLSEND
Clark's Main Staiths
COCKLE
CROW ne SAND
Jarrow Wreck Buoy
Upeth Staiths
Stormont Main Staith
Ayton Moor Staiths
Hewarth Staiths
Pelaw Main Staiths
Scale of Feet

RIVER TYNE ENTRANCE.

Shewing various Designs for Piers, that by Mr. Walker C.E. colored Red, is in course of Construction,

1855.

PARISH OF TYNEMOUTH

Tynemouth Lighthouse

Tynemouth Castle Point

PRIORS HAVEN

Spanish Fort

The Stones

BLACK MIDDENS

Mr RENDELS PIER

Mr RENDELS PIER

Mr J. MURRAY C.E

Mr TAYLOR

ORIGINAL DESIGN FOR A NORTH PIER BY W.A BROOKS IN 1832

PROPOSED BY Captn PURDO

NORTHERN PIER PROPOSED BY W.A. BROOKS IN 1851.

PROPOSED BY Mr WALKER

W.A.B. 1845

THE NARROWS

THE BAR

Contour Line of 9 Feet at Low Water

Magnetic Meridian

Mr RENDEL'S PIER

Mr TAYLOR

Herd Sand

Mr RENDELS PIER

Mr J. MURRAY C.E

PROPOSED BY CAPTN PURDO.

ORIGINAL DESIGN FOR SOUTHERN PIER BY W.A. BROOKS

LINE OF SOUTHERN PIER PROPOSED BY W.A. BROOKS IN 1851

SOUTH PIER PROPOSED BY Mr WALKER

PARISH OF JARROW

SCALE,
4 Chains or 264 Feet ½Inch.

100 50 0 1 2 3 4 5 10 15 20 Chains or ¼ Mile.

Soundings in Feet at Low Water.

READING ROOM

Day & Son Lith.rs to the Queen

NEWCASTLE REACH

GLASSHOUSE REACH

ST PETERS REACH

ST ANTHONYS REACH

LOW HEAD

Newcastle Quay

Hamburgh Whitey

Hawks & Crawshay's Bro. Yard

Watts Timber Yard

Alhusens Alkali Works

St Peters Dock Yard

Friars Goose Alkali Works

Tyne Main Coal Staiths

Broadbings Main Coal Staiths

Old Bedford House

Mordaunt Hutchinson & Co's White Lead Works

Bill Point

Bill Quay

Hebburn Shore

Routlands Quay

Wellington Quay

Black Staith

Herbert Staith

Wellington Gut

Parrots Storey

Cock Row Sand

Herbert Quay

Sec. K 140 to 150 / 146 156

L.W.	1813	647448	12.08 Increase
	49	647040	14.26 Increase
	54		
H.&L.W.	1813	3938664	16.65 Decrease
	49	4551741	1.98 Decrease
	54		

Sec. J 126 to 140 / 160 146

L.W.	1813	718433	11.25 Increase
	49	1447079	20.38 Increase
	54		
H.&L.W.	1813	573873	1.59 Increase
	49	5439827	35.89 Decrease
	54		

Sec. I 111 to 126 / 115 160

L.W.	1813	153202	3.01 Increase
	49	710144	9.76 Increase
	54		
H.&L.W.	1813	560707	1.79 Decrease
	49	586336	3.00 Decrease
	54		

Sec. M 176 to 201 / 109 84

L.W.	1813	4543551	25.34 Increase
	49	2243864	16.20 Decrease
	54		
H.&L.W.	1813	8583115	10.80 Decrease
	49	8613434	12.24 Decrease
	54		

Sec. C 97 to 102 / 132 144

L.W.	1813	398134	0.56 Increase
	49		0.58 Increase
	54	401670	
H.&L.W.	1813		1.60 Increase
	49		1.18 Decrease
	54		

Sec. F

	1813	253686	6.32 Decrease
	49	435541	8.22 Increase
	54		
	1813		0.40 Increase
	49		0.60 Increase
	54		

Sec. H 111 to 132 / 115 105

	1813	29882	23.01 Decrease
	49	67248	14.84 Decrease
	54		
	1813	38886	3.60 Decrease
	49	41458	0.57 Decrease
	54		

Scale of Feet.

0 500 1000 2000

10 C 5

CHART OF
THE TYNE,

SHEWING

ALTERATIONS IN THE BED OF THE RIVER BETWEEN THE YEARS 1849 AND 1854:

TO ILLUSTRATE

THE TABULAR STATEMENT

IN APPENDIX,

No. 29.

Note. *The Coloured Sections shew spaces in which the bed of the river has been raised, in the Sections without colour, the bed has been lowered (as compared between the Surveys made in 1849 & 1854)*

Recently made Land is shewn by a slight shading.

Reduced from the Admiralty Survey by E. K. Calver Esq.re Master R

Master R.N. made in 1849

AN

ANALYTICAL INDEX

OF THE

MINUTES OF EVIDENCE

TAKEN BEFORE

THE COMMISSIONERS

APPOINTED TO INQUIRE INTO

THE PRESENT STATE OF THE RIVER TYNE.

Presented to both Houses of Parliament by Command of Her Majesty.

LONDON:
PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1855.

1018 I

ALPHABETICAL LIST OF WITNESSES.

	Page of Index.
Allhusen, Christian	529
Anderson, Mr.	530
Brooks, William Alexander	531
Brown, Leonard	543
Calver, Edward Killwick	„
Clayton, John	548
Comrie, Alexander	554
Cowen, Joseph	555
Danson, Simon	559
Dunn, Charles	561
Freeman, Joseph	562
Harrison, Jacob	563
Lamb, John Walker	565
Linskill, Captain William	566
Macartney, George, M.P.	568
Mather, James	568
Murray, John	570
Pearson, William	573
Philipson, Ralph Park	574
Poppelwell, Matthew	576
Purdo, Commander William	579
Rendel, James Meadows	581
Robinson, John	589
Stephenson, Robert, M.P.	591
Stevenson, James Cochrane	594
Story, William	600
Straker, Joseph	„
Taylor, Thomas John	605
Ure, John Francis	609
Wake, William	611
Walker, James	612

ANALYSIS OF INDEX.

ALPHABETICAL and CLASSIFIED LIST of the PRINCIPAL HEADINGS referred to in the following Index, with the Pages of the Index at which they will respectively be found.

	Page of Index.
ACCOUNTS	529
ACREAGE	„
ACREAGE OF THE TYNE	„
ACT	„
ADMIRALTY	„
ADVERTISEMENT, THE	„
ALLHUSEN, CHRISTIAN, ESQ.	„
ANDERSON, MR.	530
APPENDIX TO MR. RENDEL'S REPORT	„
BALLAST	„
BALLAST DUES. *See* DUES.	„
BALLAST, DEPOSIT OF	„
BALLAST CONVEYERS	„
BAR	„
BED OF THE RIVER	531
BELFAST LOUGH	„
BIDDICH FORD	„
BILL OF 1849	„
BILL POINT	„
BILL REACH	„
BOARD OF COMMISSIONERS	„
BRIDGE	„
BROOKS, WILLIAM ALEXANDER, ESQ.	„
BROOKS, MR.	543
BROWN, LEONARD	„
BULBS	„
"BULLFINCH"	„
CALVER, EDWARD KILLWICK, ESQ.	„
CHALK	548
CHANNEL	„
CHART	„
CLAUSE	„
CLAYTON, JOHN, ESQ.	„
CLYDE	554
COAL	„
COAL DUES. *See* DUES.	554
COAL OWNERS	„
COAL TRADE	„
COBBLE DEAN	„
COCKCROW SAND	„
COMMISSION	„
COMMISSION, NEW	„
COMMISSIONERS	„
COMMITTEES	„
COMMITTEE, RIVER LINES	„
COMPENSATION	„
COMRIE, MR. ALEXANDER	„
CONSERVANCY OF THE TYNE	555
CONSERVANCY ACT	„
CONSERVANCY BILL	„
CONSERVATORS COMMISSION	„
CONSERVATORS OF THE TEES	„
CONTROL, GOVERNMENT	„
CORPORATION	„
COURT OF APPEAL	„
COWEN, JOSEPH, ESQ.	„
COX LODGE	559
COX LODGE AND HEATON STAITHS	„
CROSS SECTION	„
CURVILINEAR CHANNELS	„
DANSON, MR. SIMON	„
DATUM HORIZONTAL LINE	560
DATUM LEVEL	„
DEPTH	
DISPUTES	„
DOCKS	„
DRAINAGE	„
DREDGER	„
DREDGING	„
DUES	561
DUES, COAL	„

	Page of Index.
Dunn, Mr. Charles	561
Durtwich Sands	„
Ebb Tide	„
"Elswick"	„
Enclosures	„
Encroachment	„
Equinoctial Springs	„
Estuary of the Tyne	„
Extract	„
Fines	„
Finances	„
Flood and Ebb	562
Foreshore Rights	„
Freeman, Joseph	„
Friar's Goose Point, Bill Point, and White Hill Point	„
Fresh	„
Freshes	„
Fresh Water	„
Frontage	„
Fryer	„
Full Tide Jetties	„
Full Tide Walls	„
Gauges	„
Graham, Sir James	„
Grants	„
Great Yarmouth	„
Groins or Jetties	„
Guiding Piers	„
Half-tide Banks	„
Half-tide Walls	„
Harbours	563
Harbour of Refuge	„
Harrison, Jacob	„
Hartlepool	„
Hayhill Point	„
Hay Hole	„
Hay Hole Dock	„
Hay Hole Point	„
Hay Hole Staiths	„
Headlands	564
Headland, Tynemouth	„
Hebburn	„
Hebburn Quay	„
Herd Sand	„
High Lighthouse	„
Hopper Craft	„
Hopper System	564
Horizontal Level	„
Howden	„
Howdon Shoal	„
Humber and Bridgewater	„
Ice	„
Improvements, River	„
Insand	„
Jarrow	„
Jarrow Bight	„
Jarrow Docks	„
Jarrow Bill	„
Jarrow Quay	„
Jarrow Sand	565
Jarrow Slake	„
Jetties	„
Killingworth Shoal	„
Killingworth Staiths	„
Lamb, Mr. John Walker	„
Lancashire Shore	566
Land	„
Land Floods	„
Land-making	„
Land-Water	„
Level	„
Levelling	„
Letter to Sir James Graham, and Memorial	„
Licences	„
Life Commissioners	„
Lines	„
Linskill, Captain William	„
Longitudinal Sections	568
Low Lighthouse	„
Low Water	„
Low-water Level	„
Low-water Surface	„
Lynn	„
MacCartney, George, Esq., M.P.	„
Margin	„
Mather, James, Esq.	„
Medway	569
Mean Tide Water Level	„
Memorial of the 3d of August	„
Middle Ground	„
Minority	„

	Page of Index.
Mooring Fund	569
Mooring of Ships	„
Moorings	570
Muckhouse	„
Municipal Borough	„
Murray, John, Esq.	„
Narrows	573
Nene and Ouse	„
Newburn Quay	„
New Commission	„
Newcastle	„
Newcastle Bridge	„
Newcastle Quays	„
North Shields and Quay Improvement Bill	„
Northumberland Docks	„
Palmer (Messrs.)	„
Palmer's Quay	„
Parliamentary Powers	„
Parliamentary Works	„
Pelaw and Hebburn Shoals	„
Pearson, Mr. William	„
Philipson, Ralph Park, Esq.	574
Piers	575
Pier, North	576
Pier, South	„
Piers' Committee	„
Pier Dues	„
Piles	„
Pilot	„
Pilots	„
Pilotage	„
Plan	„
Plan of the Tyne	„
Plan, Parliamentary	„
Plans	„
Plans of the Tyne	„
Poppelwell, Mr. Matthew	„
Port and the Bar	579
Portsmouth Harbour	„
Posts	„
Purdo, Commander William, R.N.	„
Quarrying	581
Quay or Groin	„
Rendel, James Meadows, Esq.	„
Rennie	588
Report, Mr. Brooks'	„
Report, Mr. Rendel's	588
Report of 1851	„
Revenue	„
Ribble Company Act	„
Ribble Navigation Act	„
River, Depth of	„
River Funds	„
River Frontage	„
River Lines	„
River Lines Committee	„
River Tyne	589
River Works	„
Rock	„
Robinson, John, Esq.	„
Sailing Channel	590
Sand	„
Sand Bank	„
Sardinian Frigate	„
Seaton Delaval Estates	„
Sections	„
Severn	„
Shields Harbour	„
Shields	„
Shields, North	„
Shields, South	„
Shields Quay Inquiry	„
Shoals	„
Shoal, Hebburn	„
Shifting Sands	„
Silt	„
Silting-up in the Ribble	„
Smith's Quay	„
Solid Land	„
Soundings	„
Soundings of the Bar	591
Soundings of Shields Bar	„
South Shields	„
South Shields Harbour	„
Spar Hawk	„
Staiths	„
Steam Navigation	„
Steamers	„
Steam Tugs	„
Steam Vessels	„
Stella	„
Stephenson, Robert, Esq., M.P.	„
Stevenson, James Cochrane, Esq.	594
Story, William	600
St. Peter's Quay	„
Straker, Joseph, Esq.	„

	Page of Index.
Sunderland	605
Sunderland Dock Company	„
Surveys	„
Tay, River	„
Taylor, Thomas John, Esq.	„
Tees	607
Tees Navigation Company	„
Tidal Area	„
Tidal Basin	„
Tidal Gauges	„
Tidal Observations	„
Tidal Water	„
Tides	„
Tide Gauge	608
Title to the Soil	„
Tonnage	„
Training Walls	„
Transmission of Vessels	„
Transverse Jetties	„
Transverse Sections	„
Trinity House	„
Turn Books	„
Tyne	„
Tyne Act of 1850	„
Tyne Bridge	„
Tyne Commission	„
Tyne Conservancy Bill	„
Tyne Improvement	„
Tyne Main Shoal	609
Tynemouth	„
Tynemouth Docks	„
Tynemouth Headland	609
Tyne Navigation Bill	„
Ure, Mr. John Francis	„
Wake, Mr. William	611
Walker, James, Esq.	612
Walker	614
Walker Estates	„
Walker Iron Works	„
Walker Sand	„
Walker Staiths	„
Walker Quay	615
Walls	„
Walls, Half-tide Training	„
Walls, Training	„
Wallsend	„
Wallsend Bight	„
Wear	„
Wells Harbour	„
Wet Dock	„
Wheel	„
Whitehill Point	„
Whole-tide Walls	„
Willington and Walker	„
Willington Sand	„
Willington Staith	„
Willington Quay	„
Wincombe Lee Powder House	„
Witnesses, List of	„
Works done by the Commissioners	„

INDEX.

[NOTE.—In the following Index the figures refer to the questions in the Minutes of Evidence where page is not prefixed.]

ACCOUNTS :

The nominal revenue is about 19,000*l.*, but the sum spent in the first three years really upon river operations is only 17,000*l.*, *Stevenson*, 1279.

ACREAGE :

Mr. Webster wished to ascertain the acreage included within the river lines and the shore. Supposing the whole were enclosed without Yarrow Slake, it comes to 322 acres and eighty-five hundredths. That includes Hay Hole Dock, and also the enclosure of the convex shore opposite Wallsend Bight, *Brooks*, 4770.

ACREAGE OF THE TYNE :

Rennie's plan would leave 1,250 acres of water at high water. Mr. Brooks' lines will leave about 800 to 890 acres, but his lines will speak for themselves, *Poppelwell*, 768.

ACT :

Of 1850 was not only a compromise between Shields and Newcastle, but also with the public generally, and especially the landed proprietors, *Cowen*, 3595.

ADMIRALTY :

Have a control over the river, and a very proper one, *Robinson*, 3849.—Admiralty Commissioners : The four life Commissioners were substituted for the four Admiralty Commissioners, *Clayton*, 3303.—Admiralty letter from the Secretary to the Commissioners of the Tyne, *ib.* 3312, *ib.* 3316.

ADVERTISEMENT, THE :

Offering land with good water frontage, which relates to Mr. Ellison's property, extending from Messrs. Palmers' plan at Jarrow to Pelaw Staiths, appeared in September 1853. The application to make solid land was the 19th December 1853, *Stevenson*, 1119, 1127.

ALLHUSEN, CHRISTIAN, Esq. (*Analysis of his Evidence.*)—Is one of the Commissioners for Gateshead, 3729.—Is a merchant and manufacturer in Gateshead, and has been a merchant in Newcastle for 25 years, 3730.—Has carried on an extensive trade during that time with most parts of Europe, America, and India. Is also a shipowner, and employed his ships in the India trade, 3731.—Has two manufactories on the south side of the Tyne, with a river frontage of about 1,200 feet. In 1840 or 1842, by permission from the corporation of Newcastle, built a quay, which cost between 4,000*l.* and 5,000*l.*, with a view of obtaining a deep water frontage for his property, and believes it has generally been considered a great improvement to the river. Understands that the Shields people think that the corporation of Newcastle give such grants with the view of improving their own property. They have derived no benefit whatever from this improvement, because witness's leases for the river side property are granted for 21 years, renewable by custom; but after the ultimate termination of the leases the interest of the corporation will also cease. Therefore they could have no other object than to facilitate the trade of the port, 3732.—The property belongs to the Bishop of Durham, held by the corporation under a very long lease, 3733.—The same remarks apply to several very extensive quays built after witness's on the west side of his property, 3734.—Having considerable interest in the trade of the Tyne, naturally felt disposed to promote its prosperity. Upon entering the Commission found there were no Parliamentary powers for making permanent improvements, but simply for collecting certain dues, and for spending them upon the bed of the river, consequently witness directed his attention more particularly to the adoption of general river lines, seeing that the difference between the Newcastle and Shields Commissioners mainly arose from the difficulty of agreeing upon that point. Subsequently, at a view held on the 23d of May 1853, when

ALLHUSEN, CHRISTIAN—*continued.*

most of the parties forming the minority in the Commission were present, consulted separately with each of them, and prevailed upon Mr. Stevenson to examine with him the plans of Mr. Rendel and Mr. Brooks, and ultimately succeeded in eliciting what he and his friends wanted. The particulars were put down upon paper. Gives in a copy of the document which contains the main matters requiring improvement in the river. This document was signed by Mr. Stevenson, by witness, Mr. Dodds, Captain Purdo, Mr. Ormston, Mr. Hawks, Mr. Thomas Ridley, Mr. William Armstrong, and Mr. John Robinson. Naturally conceived that at the next meeting all differences would be at an end. However the very parties who signed it counteracted their own proceedings at such meeting. Then concluded they were not sincere in their professions to improve the Tyne at its western end. At a subsequent period witness again agitated the question, and succeeded in passing the resolutions adopted at the meetings on the 19th and 24th of August, which have been read. Immediately after these meetings Mr. Straker and Mr. Poppelwell stated that it was a great pity that the Royal Commission had been appointed, as all were now agreed, and there were no differences remaining. Still the difficulty of carrying out these resolutions remained. Mr. Stevenson objected that it was no use attempting any improvement while Mr. Brooks was engineer, and Captain Linskill thought they should be more strongly represented at the eastern extremity of the river before attempting any great works. The Shields Commissioners do not wish to do anything until either they have a majority in the Commission or till they shall have got rid of Mr. Brooks, 3735.—Has done all in his power to make the various members of the Commission harmonious, and has on several occasions agreed with the Shields Commissioners on important points, 3736.—If the depth at Newcastle be improved it must be so at the bar, because the greater the amount of water at the western extremity, the greater must be the velocity in discharging; as the scouring power is increased by superior velocity, attaches great importance to the attraction of the tidal flow to the western portion of the river, a result which would follow the adoption of the proposed improvements, 3737,—As a general question of trade and commerce, considers the interests of Newcastle and Shields are identified. The only warehouses in North Shields were in witness's occupation for a continuous period of years, 3738.—Produces Mr. Brown's export list, which shows where the trade is carried on in the Tyne. It is published by one of the Custom House authorities, 3739.—Has also an account showing the comparative importance of the two ports, Shields and Newcastle, in 1830 and 1852, 3740.—The paper produced is prepared by Mr, Brown, 3741.—Thinks he is the Custom House clerk, 3742—The document is authentic only in this respect, 3743.—The other paper alluded to relates to the number of ships which entered the Tyne in 1830 and 1852, 3744.—Has no return showing how much of the total tonnage of the Tyne stops within the boroughs of Tynemouth and South Shields, and how much comes up to Newcastle, 3745.—Agrees that so far as vessels in ballast are concerned, and which load at Shields, nearly nine tenths of the tonnage stops within the borough of Tynemouth or within a line drawn across there, and that only about one tenth comes up to Newcastle or above that, 3746.—Because the trade is carried on at Newcastle, by the Newcastle merchant, most of the Custom House business must be done there, 3747.—Believes there are but two warehouses in North Shields, and they belong to the Duke of Northumberland, 3748.—Is not aware that the corporation of Newcastle has opposed the Shields party in their attempts to get quays, 3749.—They appear to have failed for want of means, 3750.—Have always thought it would be better to abolish the present dues, there being twenty-six different dues, and that one river due should be substituted for river

Allhusen, Christian—*continued.*

purposes, 3751, 3752.—In reference to the matters agreed upon on the 23d of May 1853, the gentlemen then present have sometimes expressed themselves anxious to see them carried out, but when it came to the point they never wished to have anything done till Mr. Brooks was discharged, or they had a majority, 3753.—There has been a difference of opinion as to the mode of carrying them out; they were determined to have their own way, or not proceed with them at all, 3754.—Mr. Brooks ceded his opinions with regard to high-tide jetties; at any rate that matter and everything else was agreed upon between all parties, 3755.—Does not know that Mr. Brooks made high-tide jetties when the Commissioners had ordered him to make half-tide jetties; that must have been before witness was a Commissioner, 3756, 3757.—On an occasion preceding the 29th of September, notice had been given of a motion to this effect, "That parliamentary powers be applied for with a view to obtain "authority to apply the proceeds of land to be taken "from the river for the benefit of the funds of the "Tyne Improvement Commission." The motion was not given by witness; it was a mistake: he gave notice of a different motion, 3759.—Has already explained that the Commissioners did not possess sufficient powers for improving the river; they had no power to take an inch of ground from any landed proprietor; also incurred serious responsibilities in making half-tide or any other walls, without the written consent of the proprietors. Was desirous to obtain parliamentary powers which would permit parties to build quays with the consent of the Commissioners, which would secure a revenue, and so assist in carrying out improvements. Witness's notice of motion was given with that object, 3760.—Decidedly thinks that parliamentary powers should be obtained for carrying out river works according to some settled plan to be defined in the Act, 3761.—Agrees in Mr. Rendel's opinion that conservancy powers can never be effectually carried out without compulsory power. If other people's land is required, they must have compulsory power to take it, 3762.

Anderson (Mr.):

Was the first engineer appointed by the Reformed Corporation, *Clayton*, 3293.

Appendix to Mr. Rendel's Report:

Has never seen it used by the Commissioners, *Purdo*, 631, 633.

Ballast:

The corporation receive an amount from the conservators, from which they derive a profit, *Straker*, 129.—Thinks that no ballast should be deposited behind the groins, except chalk and chalk rubbish, and ballast dredged from the river, *ib.* 272.—Ships sending their ballast to sea is a great evil, *ib.* 358.—Has invariably objected to ballast being landed between high and low water mark, *Purdo*, 554.

Ballast Dues. *See* Dues.

Ballast, Deposit of:

Believes the licence was granted which was applied for in 1850. Witness opposed it, *Poppelwell*, 678, 679.—The Commissioners get the 1*s.* 4*d.*, and pay the corporation, or other persons who have a licence for depositing ballast, 8*d.* or 9*d.* a ton, *ib.* 681, 682.—Objected at the time of granting the licence, to the corporation, to the rate, as the corporation had themselves when conservators granted a licence to another person at the rate of 6*d.*, *ib.* 685–690.—In 1853, 64,080 tons were put between high and low water mark, *ib.* 755, and 90,934 tons of dredged material, *ib.* 756.—Wrote to the London surveyor for a return of what they took out the same time, and they took out 608,000 tons themselves that year, *ib.* 757.—Is thrown as a rule behind the training walls, *ib.* 779.—The 90,000 tons which were dredged and then deposited were paid for by the river dues; for taking it up, *ib.* 852–854.—A party pays to the Commissioners as conservators for a licence to deposit ballast, and as part of the terms of that licence they reserve to themselves the privilege of depositing (or they may do so, and have done so in certain instances,) the dredged material upon the land, but they agree to pay the party taking the licence out of the conservancy funds a certain sum for the foreign ballast; it will appear by the corporation returns, by the accounts, that upon this very transaction with the corporation, the corporation

Ballast, Deposit of—*continued.*

actually gets a profit of 800*l.* a year, *ib.* 855–864.—Still washes into the river in smaller quantities. The Commission on that point has done good, *ib.* 693.—Persons who get a licence to deposit ballast receiving a payment use it for the purpose of making land, *ib.* 697.—Approves of carrying out to sea by the hopper system, *Linskill*, 983.—To be deposited behind the half-tide walls, when the season would not allow of its being carried to sea, *ib.* 984, 985.—The ballast might be disposed of by the hopper system at very much less cost than it now costs the conservancy, more particularly as to dredging, *Stevenson*, 1221–1225.—The conservators are obliged to provide a place of deposit for ships' ballast, *ib.* 1231–1234.

—— Conveyers:

The corporation of Newcastle are ballast conveyors under the Commissioners. They make a profit of it of about 700*l.* or 800*l.* a year, *ib.* 1238–1241.—The present system is a premium upon landowners making solid embankments, *ib.* 1242–1248.—In the ballast conveying 13,190*l.* has been expended in the three years; of that 5,626*l.* has been paid to parties who made land of it in front of these properties, *ib.* 1282, 1283.—Payment to the corporation for the conveyance, 10*d.*, *ib.* 1383.—At Walker, 10*d.*, *ib.* 1383.—Reports of the Sunderland charges made in May 1852, 1835, 1836, *ib.* 1384.—Mr. Swinburne at South Shields receives 11½*d.*, *ib.* 1384.—An offer was made to convey it to sea in hopper barges, at 11*d.* a ton, in 1853, *ib.* 1390.—It costs more to take it out of ships than to raise it by the dredgers, *ib.* 1423.—Cannot take it out to sea in hopper barges when the sea is breaking across the bar, *ib.* 1427.—It is more expensive to take it from ships than dredging, *ib.* 1434.—The proprietor of the wharves are compelled to take it way, *Brooks*, 2607.—It does not add materially to the shoals, *ib.* 2609.—The ballast from ships is above high-water mark; the dredged material is only deposited between high and low-water mark upon the shores, *ib.* 2666.—When ballast is put between the groynes, it is simply the cost of putting it there; no owner of land receives anything, *ib.* 2668.—Cannot be granted to those who take it cheapest, because parties have licences which cannot be revoked for a certain number of years, *ib.* 2671.—The cheapest way to get rid of it would be to put it between the groynes, to bring the action of the current more rapidly into effect; it would cost about 4*d.* a ton, *ib.* 2674, 2678.—General statement concerning, *Clayton*, 3306.—A great part of the revenue of the Commissioners for the purpose of the Tyne is derived from the ballast, *ib.* 3536.—The Commissioners receive 16*d.* a ton for taking out and carrying away ballast, and pay Messrs. Salmon and Swinburn and Co. one 11½*d.*, and the other 10*d.* per ton for doing the duty for them, *ib.* 3555, 3556.—The ballast licence by the old corporation allows their lessees to deposit ballast upon the corporation land, or upon any land as upon the Walker Estate, and upon Willington, *ib.* 3391.—Penalties have been levied of 5*l.* and 10*l.* upon persons for throwing ballast into the river, *Robinson*, 3815.—Could be taken out of ships by hopper vessels, *Murray*, 4685.—And taken out to sea, *ib.* 4687.—At no higher cost than dredging and sending to sea, *ib.* 4688.

Bar:

Should say the bar is much in the same state it was with respect to depth, *Straker*, 38.—If there were 26 feet water on the bar, a great number of cellars at Shields would be full of water, *Purdo*, 583.—The port is rather shoaler than it was forty years ago, *Poppelwell*, 659.—Thinks the whole space of the bar has decreased in breadth from what it was, although the channel may be nearly as good as it was, *ib.* 662.—Depth of water on the bar will vary with the wind and freshes, but not suddenly, *ib.* 766, 767.—Is shoaler than it was 30 or 40 years back; has known it to vary from 6 to 8 feet, *ib.* 772.—Once this year it was 5 feet 10 inches, *ib.* 773.—Witness's opinion that the bar is shallower than it was 30 years ago is not formed from soundings, *ib.* 828.—It would be easy to make the bar deeper by dredging, *Danson*, 1544.—Particulars of the state of the bar as sounded on the 14th 1854, *Calver*, 1626–1636.—Is one of the most important subjects connected with the river, *ib.* 1754.—The bar of 1849 was exactly the same as of 1854, 6 feet 8 inches at low water, and 21 feet 8 inches at high, *ib.* 1773.—There is only about three inches difference between Mr. Rennie's rise of the tide on the bar in 1813 and that given by

BAR—*continued.*

the pilots last year, *Brooks*, 2012–2015.—Is better after heavy freshes, *ib.* 2544.—Would be satisfied to have the whole bed of the river reduced as low as the bar, but it is in contemplation to reduce even the level of the bar, perhaps 5 or 6 feet, *Taylor*, 2839.—Witness's calculations upon the state of the bar from different surveys. Has no doubt it is materially improved, *Ure*, 2872.—Thinks it equally important to the interests of both Shields and Newcastle to maintain a good bar, *ib.* 2885–2887.—Has known a variance of two feet from time to time, depending upon the state of the freshes and the wind, *Wake*, 2951, 2953.—If the bar changes very much, it is the duty of the pilot master to make that known to the Trinity House, *ib.* 3909.—Thinks the lower part of the river ought to be first put into a condition of improvement, *Rendel*, 3936.—Is within Mr. Walker's piers, *ib.* 3942.—The 9-feet bar is partly caused by the steam of flood-tide being carried past the harbour, *ib.* 3962.—Having respect to the light nature of the bed of the river, thinks the best way of improving the bar, which would be a great advantage both as regards the question of admission of ships during a longer period of the tide and as regards the increase of tidal water, is to improve the channel of the river from the very top of the tide, *Stephenson*, 4175–4179.—Thinks that the silt deposited during the time that the water between the Black Middens and the Narrows is quiescent is the true cause of the bar, *ib.* 4238.—Low water at, *ib.* 4246. (*See* Shields.)—Nine feet. Attributes the formation of it to the wheel, *ib.* 4325.—Thinks it is due to the eddy caused by the rush of water over the flat part of the Herd Sands, *ib.* 4328.—Doubts whether the deposit of a bank in this part of the channel can be prevented whilst "the wheel" stream is in force, *ib.* 4329.—It is an important thing to bring the body of ebb and flood to bear upon the bar, *Murray*, 4759.—Will be altered in its position by piers either of a shorter or a longer kind, *ib.* 4765.—At Sunderland is beyond the pier heads somewhere about 100 feet, without the pier heads, and there is about four feet of water upon it at low water of spring tides, *ib.* 4766–4768.—There must necessarily be a bar at the mouth of every tidal river, *ib.* 4769.

BED OF THE RIVER:

The general effect upon the bed of the river is produced more by the freshes than by the tidal waters, *Brooks*, 2529.—Is not much affected by tidal waters, but as soon as the freshes come it is deepened, *ib.* 2534.—Is partly filled up with marine sand, *ib.* 2546.—Has no doubt, with proper works, of being able to get the bed of the river from Newcastle Bridge to Leamington, down throughout to the level of the bar, *Taylor*, 2847.

BELFAST LOUGH:

Is a tidal estuary, but has no resemblance to the estuary of the Tyne, *Rendel*, 4026.—There is no kind of analogy between that case and the case of the Tyne, *ib.* 4275.

BIDDICH FORD:

The depth of water in 1737 at Biddich Ford, at the same high water as the one we are considering at present, was 7 feet. It is now 5 feet. Thinks the documentary is the most important evidence to the fact that the tides formerly rose higher at Biddich Ford than they do now. No navigation can now be carried above Biddich Ford, 4641, *Murray*, 4638–4641.

BILL OF 1849:

Was lost, for want of time, in the House of Lords, but had passed the Commons, *Linskill*, 915–927.—Re-introduced by the Shields Committee in 1850, *ib.* 928–931.—States purposes of the Tyne Conservancy (Shields) Bill, *ib.* 937, 941, 942.—The Corporation had none before Parliament in 1849 their Bill was introduced in 1850, *ib.* 938–940.

BILL POINT:

Velocity of tidal wave 13 miles per hour. That diminished to 8 immediately up to Newcastle Bridge, *Calver*, 1868.—Belongs to the Corporation, *Clayton* 3353.—It contains 1,000 acres, *ib.* 3355.—The work done by the Commissioners there has only perpetuated the evil which existed, *Straker*, 338.—The removal of it in the present state of the navigation, or before the discharge of the freshes had increased, would only bring up the sand again, *Brooks*, 2590.—The navigation from inside the bar to Bill Point is very much improved, *Walle*, 2990.—Mr. Brooks has cut off Bill Point above water, *Story*, 3213.—If by the construction of proper works at the entrance and at the Narrows you secure the early inset of the tide, with half-tide guiding walls, you would secure the young flood at Bill Point in less than three quarters after the tide begins to make off Tynemouth Head, *Rendel*, 4052.

BILL REACH:

The land made there will eventually be valuable for water frontage, *Brooks*, 2160.—Is from Hebburn Quay to Bill Point, *Danson*, 1519.—Blackett, of Shields, was the actual person who took the soundings. Witness and his father were both present, *Comrie*, 1944.

BOARD OF COMMISSIONERS:

Has not worked efficiently, *Purdo*, 563.—Bowes (Messrs.) and Company, objected to licences being granted them, *Purdo*, 515.—Staith at Jarrow the motion with reference to was carried, *ib*, 536, 537,—the Commissioners sanctioned the staith, but complained of the conduct of the person applying for it, *ib*, 536, 540.

BRIDGE:

Thinks that the removal of the old bridge, and the building of a bridge with an arch of very wide span, would improve the whole navigation of the Tyne, *Calver*, 1845.

BROOKS, WILLIAM ALEXANDER, Esq.—(*Analysis of his Evidence.*)—Is the engineer of the Conservation of the Tyne. Was also engineer to the former Conservators from 1842. Produces plans which belong to the office of engineer to the Commissioners. First produces a plan by Fryer, the date of which is 1782, which contains a series of soundings taken at low water. The original plan extends from Hedwin Stream, which is the limit of the tidal flow, down to the bar; and witness puts in at the same time a reduced plan of that survey from Newcastle Bridge to the bar. Beginning at the bar, finds the depth shown at low water is 7 feet, and the greatest depth in Shields harbour is 20 feet, that is, at low water. Proceeding up the river finds abreast of Jarrow Quay a wide expanse of very shoal water, varying from one foot to four, and extending three fourths across the river, that is, from the south to the north, showing that the entire region on the Jarrow or south side was one mass of shoal water, 1982.—This was in 1782. Then abreast of Howden, where a 4 feet depth of water has been previously referred to in the evidence as existing, finds only a depth shown of 2 feet, being about the depth given by witnesses at previous inquiries. At that time the navigable channel in the vicinity of Hebburn lay very near the south shore, and nature at that time appears to have done what has been attempted to be executed; in fact, it has been executed by the works of the Commissioners and by the old Corporation, that is, to shut out the channel through Wallsend Bight; there was no passage on the north shore through Wallsend Bight extending from the Walker shore down the river; it covers up the passage about Wallsend Bight. Puts in the plan of the Commissioners, made for Mr. Rennie in 1813 by Giles and Comrie, also puts in the plan which accompanied witness's report of 16th January 1843. That plan has upon it two lines, one representing those designed by witness, and the other representing the lines of the late Mr. Rennie; they were taken from Mr. Rennie's plan; that plan contains certain deviations from Mr. Rennie's line. Reads an extract from the report which accompanied that plan. This report goes on to show that in order to keep deep water at the numerous staiths which had been erected subsequent to Mr. Rennie's time on the northern shore at Hay Hole, it was requisite to change his plan, and for that purpose witness recommended works to be erected on the southern shore, to turn the main body of the ebb tide on to the north side, instead of on the south side, as shown in his plan. When he entered upon his duties of engineer to the Conservators, found that certain works were then being carried out upon Mr. Rennie's line. A quay or groin was in progress at Willington, and the effect of that was greatly to change the channel or shoal the water in the neighbourhood of Hay Hole, and if that work had been

persevered in, and Mr. Rennie's lines had been strictly abided by, the result would have been the entire closing up of the Hay Hole Channel. This would so seriously have endangered the welfare of the port, that he, in that report, pressed strongly upon the then Conservators, that that plan, which was made by Mr. Rennie, should be deviated from. The result was that the Corporation adopted witness's report with reference to that part of the river, and subsequently certain works were constructed in the bight above Jarrow, with the intention of throwing the water on to the north shore. At the time of commencing his duties, a sand had grown up on the north side, blocking up the Hay Hole Channel. Puts in a plan of the river from White Hill Point to the neighbourhood of Hebburn, in which is shown, in red lines, the condition of the river in subsequent surveys. That was made in 1844, before these works were commenced for altering the channel, which shows one mass of sand, extending two thirds across the river from the north towards the south side, being many acres in area. The region of shoal water, which dries at low-water spring tides, extends in the direction pointed out by this line, the whole of the space shown being dry at low-water spring tides. There is a small channel of about 15 inches at low water, so that it is one mass of sand on the north shore, from the Seaton Delaval estates up to Howdon Dock. Subsequently works were constructed in Jarrow Bight, which were not commenced, however, till 1848, and which were finished in the November of that year. Two jetties were erected, and the effect of that was to cause an immediate alteration in the state of the navigation; the channel, which had been closed against the passage of the ebb-tide through the Hay Hole channel was re-opened out, and the plan which witness will produce shows a totally altered state of things, resulting from the work projected by him. If those works had not been constructed in the Jarrow Bight the result would have been that the great mass of sand would have risen several feet higher, and believes it would have been quite impracticable for the parties shipping in the Hay Hole to carry on their trade. Points out how that affected the condition of the landowners on the south side. A plan was given in to Mr. Brown, who owns a large tract on this shore, showing the extent of land which he would gain, supposing the navigable channel were turned to the north side. Now the result of carrying out those works, while it has given deep water on the north side, has certainly caused very great inconvenience to the parties on the south side. Now the parties who have that shore are again disappointed, because, after having had all this inconvenience for some years, the water shoaling, while the water on the north side has got deeper, the state of things is now totally changed. The Commissioners are now making a wet dock on the north side of the river, which will restore the river, in point of fact, to the condition as previously recommended by Mr. Rennie; that is, the part of the Hay Hole Bight included between Hay Hill Point and Willington Quay will be thrown into a large wet dock, containing 66 acres of water, and the parties on the south side will get no land. They have suffered inconvenience, and are now defrauded of the expectations which were held out to them. This survey will show what was the state of the river in the neighbourhood of Black Staiths. A large mass of sand existed abreast of Muckhouse; the ebb tide from the shore near Wallsend, towards Black Staiths, deflected to the north side, left a mass of sands, which was dry at low-water spring tides, about 3 feet 6 above low water, which at the present moment appears by the soundings to have totally gone away, and there s deep water at that place. In the early part of witness's employment under the Corporation there was a very bad shoal existing near Hebburn Black Staith, which was known by the name of Killingworth Shoal; that remained for several years; it had on it not more than 2 feet water at low water. Frequently grounded in a small steam boat drawing 3 feet, and remained there an hour or an hour and a half. Has seen 9 or 10 small river steam boats aground there at the same time, and lying there a considerable period. That was caused by the channel changing abruptly from the north side to the south. Higher up Hebburn Shoal is in the same condition. When witness entered upon his duties, and for many years afterwards, the direction of the current of the ebb, after leaving the Bill Reach, was along the Hebburn Quay side, and then it changed abruptly towards the north, and the consequent effect

was that there was only two feet water at low-water spring tides there. That depth existed as far back as 1832. Hebburn Shoal was the standing grievance in the Tyne at the time witness came. The Tyne Main Shoal on which he grounded in 1832 had disappeared at that time; if was formerly the worst shoal in the river, though it does not appear at all upon Mr. Rennie's plan, any more than Howdon Shoal. Howdon Shoal appears to have lain between two lines of soundings, just the same as Tyne Main Shoal; it is notorious that Tyne Main Shoal existed as well as Howdon Shoal. The line of soundings being three chains apart, it may be very easily conceived that shoal water might escape observation; it could not escape the keel of a steam boat when passing through it. That was the case on the north-east side. Another plan was here produced. At the time of entering upon his duties under the old Corporation a very bad sand existed in the Walker Reach, which is shown upon Mr. Rennie's chart, and also a bad sand existed, called Bill Sand, in the reach above Bill Point; it is shown very strongly upon Mr. Rennie's chart, but is not upon this one, for this plan was made after that sand was removed. There is a small plan which will show the nature of it better than referring to a very large plan. This, a reduction of Mr. Rennie's chart, explains the plan. In 1847 works were executed in the bight above Bill Point, where a very tortuous navigation existed. There was deep water along the northern shore, but it was narrow and so dangerous that two vessels could not safely pass each other. Those works are referred to in witness's report of January 1843. They were commenced in October 1847, finished in about two months, cost about 800*l.*, and their almost immediate effect was to drive away that sand which existed opposite Bill Point in the channel. The form of that shoal still exists, but there is deeper water over it. Refers to the evidence given by Mr. Calver upon this part of the river, where he says that now the navigation is exceedingly easy there. It is improved as to depth, and also as to straightness. The Tyne Main Shoal had been removed by the former Conservators before witness commenced his duties. Certain dredging took place, a quay was constructed on the south side, and it has not since been complained of. That is an improvement, of course, effected in the navigation. Whatever may be its present state, you will have to contrast its condition with the governing shoal, which had only 13 feet 6 inches upon it at high water of spring tides. Another plan, being a reduced chart of the River Tyne from the survey made by the late Mr. Comrie in 1849; it is in the same state as regards the previous plan. This shows the state in 1849, when Hebburn Shoal still existed, the same as is shown upon Mr. Calver's chart of the same year. Mr. Calver shows, however, in his survey rather a greater depth of water, a few inches more upon it than Mr. Comrie shows; however, the depth then was about 15 feet 10 inches. Walker Sand had been partially acted upon, but it was not effectually removed. At that time the channel still took the same tortuous direction across Hebburn Shoal from the south to the north. Made frequent reports to the present Conservators, urging the propriety of expecting effective works on the south side, on the Hebburn Quay side, to force the channel into its natural course on the concave shore. It is rather an extraordinary circumstance that the deep-water channel should exist in what is apparently a convex shore; but that is a fact proved by all the old surveys. You would naturally expect that the tide, after leaving the deep bight at Bill Point, would have shot over to the north side, leaving Hebburn Quay Shoal. Believes that was due to a projection which existed in the line of quays at Wincombe Lea, and which, perhaps, originally caused the formation of this Walker Sand. The consequence was, that there was a deep hole, useless to the navigation, but which kept the channel on the south side. If that pool had not existed to the extent which is shown, the jetties would have been quite sufficient to have turned the flow of the tide into the required direction; and it was, therefore, that witness was compelled to request that those jetties, as a temporary measure, should be extended to force the water more to the north side, and cut out a channel through the Walker Sand, making the deep-water current through what ought to have been its natural course. After very much opposition, that wish was gratified. He was enabled, temporarily, to extend the jetty at Hebburn Quay 100 feet beyond his own river line, and the jetty westward 66

Brooks, William Alexander—*continued.*

feet. That produced a very great change for the better, but did not effectually remove the grievance; and then it was that he urged upon the Commissioners to proceed with the execution of the other jetties on the Hebburn Quay side, which were mentioned in his report of January 1843, which at that time had not been executed; those jetties were made, and ultimately extended beyond the length which witness originally intended; the result was, that Hebburn Shoal was effectually removed at a comparatively small cost. Now these jetties are only made of timber; it is an exceedingly cheap mode of changing the current of the water. Believes it has not been practised in any other place, excepting previously in the Tees, where witness had effected a considerable change in the state of the navigation, reducing the low-water surface about 3 feet, and enabling large ships to get up to Stockton. There no training walls were made, just as no training walls were made above Bill Point, between the three jetties shown on the plan; a low wall was made subsequently from the outer point of the lower jetty in the direction of Bill Point, because witness felt that if any accident should occur to any ships getting upon the Bill Point, after the execution of his works, he no doubt would have a loud outcry against him that those works had been the cause of it. No vessel has ever been damaged upon the Bill Point, which was left by his predecessor as a sunken rock; it had been excavated about 70 feet from the south towards the north, to cut it down to low water at extreme low ebbs—in fact, 6 or 8 inches below low water; it was a shaley sort of sandstone, and easily worked up by picks. Produces a tracing of Mr. Calver's recent survey of last summer, which extends from the west end of Hebburn Quay to the middle jetty of the Wallsend Bight. The depth shown on Hebburn Shoal appears to be above 5 feet. Reads over the soundings where the shoal existed on each line at low-water spring tides. Puts in another plan furnished by Mr. Calver yesterday, upon which he has given evidence, and upon which he was cross-examined. This plan (pointing to an enlarged chart by Mr. Calver,) shows only 3 feet 9 inches in the present navigable track opposite the lower end of Jarrow Quay, and maintains that Mr. Calver's own survey shows a greater depth; it shows 5 feet throughout. It is true that this is a little more to the north. Has marked in pencil lines the course which a ship should take. Reads the three soundings in the vicinity of this track. Unless Mr. Calver has got other evidence to advance showing that he found shoaler water on the part where he has traced his 4 feet contour lines, unless he can advance other soundings proving that shoaler water is found in it, these soundings demonstrate that not less than 5 feet 3 inches exists in that direction. The contour lines are supposed to be traced through the soundings. Contends that that is not proved by those soundings. Those soundings do not support Mr. Calver's plan; they do not support the depth of water which he maintains to have existed on the shoal. That is a copy of Mr. Calver's survey. 1984.

Brooks, William Alexander, Esq.—(*Further Examination.*)—Refers to the chart, and states that Mr. Comrie's recent soundings show that no shoal water exists over what Mr. Calver calls the new shoal, it having also been admitted that there was at least 18 feet water over what he calls the new shoal, showing more than 4 feet at low water, the rise of tide being 13 feet 6 inches. Mr. Comrie's soundings in 1854 confirm witness's statement, 2001.—States that when Mr. Calver shows on his plan that the dredger was at work on the shoal, she was actually at work lower down. Thinks it unnecessary to enter into the question as to the bar, as Mr. Calver states that he only meant the navigable depth of the channel, and the original dispute was that he meant the sectional capacity or discharge of water, 2002.—It has been stated by witnesses that the works ought to have commenced from the sea or from the eastward. If it had commenced that way it would have entailed much greater expense upon the Commissioners. As an illustration, when witness began his duties, Mr. Anderson was carrying on a groin at Willington, and afterwards a wall in a westerly direction, what is called against the ebb; it was made of rubble stones, and the scour of the ebb tide striking against the work made a very deep hole, which required a greater quantity of rubble to fill up than would have been necessary if the work had advanced in a contrary direction. A staith was erected, closed with planks, which shut out the tide, and the work advanced with

Brooks, William Alexander—*continued.*

less than one half the materials previously used. States with reference to the jetties, that if the river line is to be formed by chalk or stone, the work is executed more cheaply if you first construct a groin on the ebb side of the stream; a deposit takes place, and your half-tide wall is constructed at comparatively small cost. The annual expenditure on river works has not been more than 5,000*l.*; great expenses have been necessary to keep open the establishment at Hay Hole and on the Jarrow side, which were affected by the attempt to carry out Mr. Rennie's plan. On examination of the late Mr. Comrie's very carefully prepared plan, it has been found that Shields harbour is very considerably deeper than in Mr. Rennie's time. The pool at North Shields, which is the most valuable part of the harbour, has in some parts as much as 40 feet at high-water spring tides. The channel is very much increased in breadth at that spot opposite North Shields and through South Shields, the sand is pushed considerably more to the south. This arises from the arrangements in moving the ships. Places before the Commissioners a plan, copied from Mr. Comrie's survey of 1849, showing contour lines in the middle, as existing at that time. The middle ground is in a much better state at present; it is still a shifting sand, and considers it would be a waste of time to base any observations upon it. The Narrows are a more fit place to test, because there you have comparatively solid banks. The one great cause of the Narrows being so limited in width is, the set of the currents of the flood tide; one portion of the current sets over the Herd sand and throws the southern region of the Narrows into an eddy, and another portion, which comes in on the north side, throws the northern division into an eddy state. Refers to a chart to illustrate the set of the flood tide, and to show how works might be executed which would have the effect of enlarging the Narrows, and compensate for the obstruction created by piers, because the great obstruction is not at the bar but at the Narrows. The width between the high-water line is now less than 700 feet, and the sand on the south side is very much more in altitude. At the first inquiry into the Conservancy Bill, there was a complaint against the old conservators that the breadth of the channel had diminished at the Narrows. The next year there was also an inquiry before Parliament, but no more was heard of the complaint. The action of the winds had washed away the sands, and the base of the beacon was dry. The stones originally placed round it to keep it in its place were quite bare, 2003.—There is not much difference in the depth and rise on the bar between Mr. Rennie's survey in 1813 and the present time; witness would like to lay before the Commission, surveys which will be verified by another witness. Transverse sections, made in Mr. Rendel's office, of the river, going westward from the beacon in the Narrows. They show the state of the navigation in 1813 and 1849, and the last are soundings taken by Mr. Comrie last year. No. 1 is the sounding in the Narrows opposite the beacon, the others go westward, 2007, 2008.—The depths are laid down to a scale, 2009.—It can only be verified by the soundings on either chart, 2010.—The No. 1, 2, and 3 show a large scale, if they have been taken correctly; (can produce a party to prove that he put them on correctly,) 2011.—There is only about three inches difference between Mr. Rennie's rise of tide on the bar in 1813 and that given by the pilots last year. The pilots take their rise of tide from a place called Coble Landing; they do not give the true depth; they give about a foot in, on the safe side, 2012, 2013, 2014. —The results given by Mr. Pearson agree with Mr. Calver's recent surveys. There is no difference between Mr. Calver's surveys and Mr. Comrie's as to the water on the bar; it is about 22 feet 3 inches. Mr. Calver makes his observations from a gauge kept at the Prior's Stone, 2015.—The Commissioners are about to execute piers at the mouth of the harbour; when the sanction of the Admiralty is given to the details of the plans the works will proceed rapidly. A number of plans, some by eminent men, were submitted to Mr. Walker for his final decision as to the direction of the piers; witness gave one as far back as 1832, 2016.—The Admiralty sanction has been obtained to the direction of the piers on Mr. Walker's line, which is the same as witness's, who was the original projector of the piers, 2017, 2018.—The Herd sand on which the south pier is to be constructed has been bored by Mr. Rendel to a depth of 30 feet, and was found to consist of nothing but sand, and in conse-

BROOKS, WILLIAM ALEXANDER—*continued.*

quence the Admiralty have compelled the Commissioners to make a mere rubble breakwater, which would have the same effect as an expensive work of masonry, 2019.—No estimate of cost has been given beyond the Parliamentary estimate, but tenders have been received for commencing the work on the south side at a price below the Parliamentary estimate, 2020.—The amount which can be raised at present is about 230,000*l.* or 240,000*l.*, but as the entire capital would not be required in the first instance, they would have the advantage of the accumulation of income. The income from pier dues is about 12,000*l.* The opinions of Captain Vetch, Captain Washington, and Mr. Calver were in favour of the north pier, 2021.—Thinks nautical men are often better able to give an opinion on these points than engineers. Changed the direction of the north pier with a view of rendering it more safe for vessels coming in. Mr. Rennie's south pier was placed so that any vessel coming in in a north-east gale of wind, while endeavouring to avoid the shoal water called the Spar Hawk, would run the risk of being carried to leeward, and wrecked upon the south pier, 2022.—Shows the improved line which is generally sanctioned, 2023.—States that the Commissioners are making very extensive docks above Hay Hole Point. The general effect of the works must be the reduction of the low-water surface. The Tyne Improvement Commissioners will bring witnesses to show that the water now generally falls out 9 to 12 inches lower at Newcastle than formerly. The tide at Bill Point and at the jetty is frequently seen 9 inches to a foot below the bottom of the low-water gauge, 2024.—Had nothing to do with the reduction of the soundings; never interfered with Mr. Comrie, 2025.—The secretary has the plan accompanying witness's report in January 1843. The river lines are the same with the exception of a fresh blue line in the neighbourhood of Jarrow, making the river a little wider, 2026–2030, 2031.—It is the plan produced before Captain Washington on the inquiry in 1848 as the plan of 1842, 2032.—It is the plan according to which the works were generally carried out, under the late conservancy, as well as under the present, 2033.—The works executed were intended to be executed as river lines up to those lines, 2034.—At Bill Point they have been, where the jetties are laid down, 2035.—Does not believe that the jetties at Bill Point are considerably beyond the line in one part, and short in another, 2036.—Has seen this other plan, now produced, but does not admit its accuracy, 2037.—Does not know whether it was the plan produced in Parliament in 1849–50; was cross-examined for some hours on that point, 2038, 2039.—The three jetties at Bill Point come very near to the line; the westernmost jetty is not out to its full extent; the depth of water was obtained before going to the full extent. The easterly one is a longer jetty than the two westerly ones, 2040–2042.—Made a deviation from Mr. Rennie's plan in order more effectually to remove the Bill sand; the sand has gone away, and navigation has been produced, 2043, 2044.—The westerly jetties are carried beyond Mr. Rennie's line, but not up to witness's within 20 or 30 feet, 2045, 2046.—At Losh, Wilson, and Bell's, Mr. Rennie's line was within witness's; a portion of their quay is built upon Mr. Rennie's line, 2047, 2048.—Witness's line projects beyond Mr. Rennie's along the reach by Losh, Wilson, and Bell's, 2049, 2050.—Witness's line goes beyond Mr. Rennie's line at Bill Reach, because he has not followed the system of carrying out a line as laid down in Du Buat's work; he has not made the north shore or the north quay line a tangent to the curve (down Wallsend bight), below which it ought to be, to secure a proper direction for the current, 2051, 2052.—From Bill Point down to nearly the west end of Walker's New Quay witness's line is beyond Mr. Rennie's, 2053.—If Mr. Rennie's line had been made as laid down there, there would not have been so good a depth of water for the navigation, 2054.—On the south side of the Tyne witness's line is considerably beyond Mr. Rennie's, 2055.—Witness proposes to narrow the channel considerably more than Mr. Rennie. The extent varies in every part of the reach, as much as 264 feet where the bight exists. The narrowest channel, which is at Bill Point, is about 520 feet. At that point there is a difference of about 100 feet between witness's and Mr. Rennie's; the channel at the west end of Walker Quay is not much wider than it was formerly, 2056–2063.—If witness's lines had been carried out, the Walker Quay would not have been upon them, but a great portion of that was constructed on

BROOKS, WILLIAM ALEXANDER—*continued.*

Mr. Rennie's line before witness entered on his duties as engineer, 2064, 2065.—There is no change made in Walker Quay. A part of the Walker Iron Works are carried out to the line with the consent of Losh, Wilson, and Bell, 2066, 2067.—Can furnish the quantity of land gained, which cost a good deal of money, which was furnished by the Walker Iron Works, 2068–2071.—It was made with slag from their own works; witness had a great deal of slag from their works for nothing for making the river walls; they wanted sixpence a ton for it, but he refused to give it, 2072, 2073.—Supposing witness's line were carried out, there would not be much land reclaimed on the south side between Bill Point and Walker Quay, 2074, 2075.—The distance from witness's line to the high water line, opposite Walker's Staiths, is about 200 feet, all beyond Mr. Rennie's line, 2076–2082.—At the Coxlodge and Heaton Staiths the works were carried out to Mr. Rennie's line before witness came on to his duties, 2083–2086.—Witness's line coincides with Mr. Rennie's there, but would have preferred carrying the works further to the south, and not having any works on the Hebburn Quay side, 2087.—Witness's line goes beyond Killingworth Staiths about 60 feet; they are beyond Mr. Rennie's about 60 feet, 2088, 2089.—Was examined before Captain Washington and the House of Commons, 2091.—Does not think the works at Killingworth extend 140 feet beyond Mr. Rennie's line, and 60 feet beyond witness's line; it is a mistake, 2092.—The works were executed by the owners of Killingworth Colliery, 2093.—They were commenced in December 1844, 2094.—Was engineer to the conservators at the time. Does not believe they extended 60 feet beyond the lines laid down in the report of 1842, and 140 feet beyond Mr. Rennie's; the alteration in Mr. Rennie's line at that spot, and at Willington, was made with a view of throwing the deep water more in the Hay Hole Channel. If the works had been kept, as shown by Mr. Rennie, they would not have produced that result, 2095, 2096.—Does not believe the staiths at Wallsend and Killingworth Staiths extend beyond both lines, 2097.—The promise of land which was held out by the former conservators to owners on the south side near Jarrow was not kept, 2098, 2099.—The promise was to the effect that if they consented to the construction of works on that shore, to have the effect of turning the channel into the Hay Hole Channel, they should be full-tide works, they should have the benefit of the land which was made, 2100.—The uncertainty would only apply to where a change had been made; as, for instance, at the Jarrow works, where Messrs. Palmer made their application. The original line on the south side advanced more to the north. The new line was made concave, so that eventually they would have had a fair depth of water, 2102.—Willington Quay is nearly opposite Messrs. Palmer's, 2103.—When witness came he found Willington Quay upon Mr. Rennie's line, 2104.—Made it go beyond it, because it was necessary to force the current into Hay Hole, 2105.—Witness projected and executed Willington Quay on his line and beyond Mr. Rennie's at the west end to the extent of about 100 feet, 2106–2108.—At Willington Quay there has only been a sacrifice in the property of the corporation; as regards depth Willington Staith is the worst in the river, 2109.—If the plan projected by witness had not been carried into execution the Hay Hole Staiths would have been nearly dry, 2110.—The consequence of the execution of the Willington Quay was the silting up of the Hay Hole Staiths, 2111.—Witness's works swept away nearly 23 acres of dry sand, 2112.—States that the projection of the piece of corporate property at the west end of Willington Quay improved the condition of Hay Hole in connexion with other works on the south side, 2113.—The Hay Hole Staiths require frequent dredging; not so much tide goes down as formerly. Old charts show that it was formerly a shoal place; generally it was deep water, and a capital shipping place, 2114.—In consequence of the works carried out by witness there is now 5 feet of water through at low water spring tides, 2115.—The town clerk's observation that the staiths in Hay Hole became prejudicially affected by the Willington Quay having been erected on Mr. Rennie's line is quite correct, 2116.—The Commissioners have hanging over them claims in respect of damages which may accrue by continuing the improvement on Mr. Rennie's line, 2117.—The Hay Hole Staiths are worse, because they were not restored to their former state of deeper water,

BROOKS, WILLIAM ALEXANDER—*continued.*

2118.—The promises to Messrs. Palmer and Co. and Mr. Ellison about the land they were to get, were made through the River Committee of the corporation, 2119.—Gave Mr. Brown a plan showing the new line of frontage, 2120.—Knows of no other case excepting that with regard to Mr. Brown of Jarrow, 2121.—Has always stated that the lines were to be full-tide lines, they would not have been executed if they had not been, 2122.—The works being carried on at the time of the report in 1842 were all full-tide works. The jetties are all made rather above the level of high water spring tides, 2123.—It was always understood that the works were to be full-tide works, 2124.—Does not know if it appears in the report, but there is no allusion to half-tide works. They would eventually become full-tide works without full-tide jetties, 2125, 2126.—Has not had time for anything of the sort in the Tyne at present, because it is a very slow process, 2127.—The reason Jarrow Slake is not converted into land is because the course of the flood current sets heavily in, and tears up the deposit which has been made by the previous eddy, produced by the ebb current. On the ebb the Jarrow Slake is in a silting or eddied state, and on the flood there is a heavy range of current over it, when the Jarrow Dock works are made the current will be directed better into the main channel of the Tyne. Any person who examines the water will be struck with the difference between the water on the north and south side of the river, 2128.—Can give no instance in the Tyne in support of former opinions, as no half-tide works have been made under the same circumstances, 2129.—Is satisfied that the opinion expressed by Mr. Straker and other persons conversant with the river, that the surface, though it has grown up to the half-tide jetty, will be kept clear above by the wash of the tide and other causes, is erroneous, 2130.—Knows instances in a river where you will find grass growing above the level of the walls, and the land between the jetties is above the level of the walls, 2131.—Witness's report of 1842 professes to carry out the general principle of Mr. Rennie's report, 2133.—Half-tide walls were not mentioned in Mr. Rennie's report, except in the neighbourhood of Jarrow Slake. They are jetties commencing at high water on the shore, and pointing down to a little above half-tide at their ends, 2134.—Has never said Mr. Rennie's were full-tide jetties; has executed full-tide jetties, and knew these works would eventually have the same effect, and convert it into land only in a longer period, 2135, 2136.—Witness's object was to improve the navigation. You cannot improve the navigation where it is so bad without making land, 2137, 2138.—Witness has stated before that he believes Mr. Rennie never contemplated full-tide jetties, 2139, 2140.—Finds it as he stated on the original plan; it goes over the shoal water, and then it comes to the shore. It goes away to nothing, 2141, 2142.—There is no sailing channel to the extent of 896 acres, 2143.—The 896 acres referred to by Mr. Rennie are the area between his walls, 2144.—Had no intention of making any walls at all between the east end of Hebburn Quay and Black Staith, 2145.—That is not the classsic ground about which there has been so much contest, 2146.—Points out Messrs. Palmer's and Messrs. Leslie's encroachment, 2147, 2148.—The area is about 44 acres between Black Staith and the east end of Hebburn Quay. Is alluding to the stone jetty above Black Staith. The Commissioners wished to try the experiment of what a half-tide wall would do, 2149.—Witness thought that that piece of land might be left open, 2150.—It was the Shields gentlemen and Captain Purdo who urged the trial being made with a half-tide wall, 2151.—Mr. Leslie made the application for the grant of land for Messrs. Leslie, the resolution recommending the construction of this half-tide wall, which would have the effect of converting this large space into land was from Mr. Poppelwell, 2153, 2154.—Should say the plans supplied to Messrs. Palmer and to Mr. Ellison were the same as the large plan above, 2155.—There was a plan made by Messrs. Palmer, and deposited in the Commissioners' offices, 2156, 2157.—The altered line was the one setting the line a little more to the south, in consequence of the intended construction of the Hay Hole Dock, 2158.—Thinks there was a plan signed by the chairman brought before the Commissioners; hopes to produce it on Monday, 2159.—Was not aware of an advertisement, advertising the land as land with valuable water frontage. The part in Bill Reach will be valuable, but that opposite the Cockcrow Sand will not be valuable, 2160.—It will be useful for manufacturing purposes, but with a convex shore they can never have deep water, 2161.—That was a remarkable instance of deep water in the Tyne, with a convex shore, which witness mentioned, 2162.—Mr. Forster is Mr. Ellison's agent; there used to be deep water opposite Ellison's Quay, but the sand is rising there rapidly, and there will be a shoal there soon, 2163.—Has been in the habit of attending the River Lines Committees, 2164.—Does not know how many Committees there have been; has always attended them. Does not think there have been more than two or three, 2165–2167.—Witness's lines have never been formally adopted by the Commissioners, 2169.—The works have gone on according to the lines laid down in witness's report of 1842, and the river improved thereby, 2170.—The land has not been made yet in some places, 2171.—The plan usually produced at the meeting of the Commissioners had no soundings upon it, 2172.—There was always a discussion as to the quantity of land to be taken. Mr. Leslie's was only about a half or three quarters of an acre, 2173, 2174.—Furnished information respecting the quantity to be taken by Mr. Palmer, 2175.—There was a difference of opinion as to how far the grant was intended to go, so that it was a considerable time after the resolution was passed before the information was furnished, 2176.—Always thought that it meant that the entire extent from the west end of Jarrow Quay to the Muckhouse should be converted into land, 2177.—The discussion took place amongst the River Commissioners at their meetings, 2178.—Mr. Phillipson never interferes upon engineering points, 2179.—The Commissioners asserted that the quantity of land granted to Messrs. Palmer was about 5 acres, and Mr. Phillipson asserted that it was about 15 to 20 acres, 2180.—Mr. Philipson is the solicitor of Messrs. Palmer, 2182.—He is a Commissioner now, but was not a Commissioner for a considerable period, 2183.—He was a Commissioner under the Act of 1850, and then retired, but was re-appointed by the Town Council at the last election in November. All the discussion took place while he was not a Commissioner, 2184.—The chairman suffered very greatly from the plan, 2185.—He has never made any claim for compensation in land; he would not get any land there, 2186, 2187.—He has been asking for some dredging, and he deserves it, 2188.—Since the carrying out of the jetties his establishment has become so bad that it requires dredging, in consequence of a diversion of the course of the ebb tide, 2189.—Leave was given to execute the Hebburn jetties, on the understanding that it was for a temporary purpose, 2190, 2191.—No deposit has been made there; a certain amount of silt will lodge behind them while they remain, but it will partly go away again when they are removed, 2192.—Would be very sorry to leave the jetties there; the effect of the contraction is to give a depth of 20 feet water below the level of the datum tide in that region of the river. Has no doubt that if the other jetties were advanced in a similar proportion there would be 20 feet water up to Newcastle by the contraction. Has laid out the lines with a view to further improvements above bridge. On the removal of the old bridge, or a better discharge of the freshes, by either increasing the rapidity or shortening the duration of the discharge, it will then be found that the lines are not too far apart, 2193.—Witness's jetties produced such an increase of water at Stockton-on-the-Tees, that vessels could come up at neap tides as formerly at spring tides, 2194–2196.—There was one new cut, shortening the navigation, and the effect is that the land floods which used to overflow the quays at Stockton now, unless unusually high, never go upon them, 2197.—The cut was recommended by witness's tutor at the time witness was resident engineer to it, 2198.—The cut is distinct from the jetties; it shortened the navigation considerably, 2199.—The bends were greater than the sketch shown, 2200, 2201.—Can prove what he asserted before Mr. Walker, that the water fell at Newcastle Bridge a foot more than it used to do, 2202, 2203.—The observation was the result, not only of tidal observations, but of the tide guage. At a low ebb there is now 12 feet 6 inches rise at the quay at Newcastle from the low water up to the datum, instead of from 11 feet 3 inches to 11 feet 6 inches, as shown on Mr. Rennie's survey, and also by Mr. Calver, 2204.—Had tidal observations in 1850. A great depression has taken place since the removal of Hebburn

BROOKS, WILLIAM ALEXANDER—*continued.*

Shoal. There is now the same flow at Newcastle Quay with a clean ebb, as in the old state of the river there was at Hebburn. Can prove that the water gets away better in Shields Harbour, 2205, 2206.—There were no soundings on the large plan produced before the Commissioners, but had some sheets with soundings, which witness occasionally produced, 2207.—Longitudinal sections, showing the changes taking place in Hebburn Shoal, have been furnished, not frequently on account of the sand being in a shifting state, 2208.—Has furnished the Commissioners with both longitudinal and transverse sections, showing soundings, 2209.—Produces a longitudinal section of the river taken in January 1852. It has upon the same plan a longitudinal section which has the date of 1816, which is the time of Mr. Rennie's report, but it it should be 1813, because the surveys were taken from Messrs. Giles and Comrie's plan. That plan shows the Hebburn Shoal. There is another plan of the same date, showing a portion of Long Reach, 2210.—They are all longitudinal sections, 2211.—Thinks transverse sections are also requisite; the soundings are taken from transverse sections, 2212.—Has no recollection of ever having asserted that longitudinal sections were the only ones of any use, 2213.—Thinks the transverse sections ought to be taken directly across the channel, but if you take the form of a shoal they ought in addition to be taken along the crest of the shoal, 2214.—Thinks cross sections are of no use, unless they are very close together. The soundings on Mr. Rennie's chart do not show the Tyne Main Shoal nor the Howdon Shoal, though it is notorious that they both existed, 2215.—The more transverse sections there are the better. Will bring a plan showing the survey of the river above bridge, with very close soundings; where there is a shoal existing the lines are multiplied across it, so as to get a more correct contour of the shoal, 2216.—A longitudinal section, if closely taken, would show the available depth of water, but would not show the course of the channel, 2217.—Longitudinal sections alone would not show the tidal capacity, 2218.—Has obtained for the harbour what was proposed in the report of 1842, as regarded the depression of the low-water surface, 2219.—Would engage to pilot a vessel of 17 feet draught up to Newcastle at the present time, 2220.—A vessel drawing 16 feet has got down from Dent's Hole. She was a frigate worth about 60,000*l.* It would have been very unwise to trust a vessel of that value with only a foot of water under her; and as the channel below the Pelaw Main Staiths is narrow, the dredger was put to work for several weeks, and she took up a quantity of ballast, of which one third was coal, 2221.—There has been no dredging at Hebburn Shoal since the jetties were lengthened, 2222.—Those jetties are sufficient to clear the channel, without any dredging, 2223, 2224.—The dredging was below, to widen the channel at Coxlodge. There was some dredging opposite Miller, Ravenhill, and Company's ship yard, to enable them to launch a vessel, 2225.—Will produce the dredging book on Monday. The only dredging on the Hebburn Shoal was when the jetties were intended, 2226, 2227.—Could have executed the jetties in two years if he had been allowed; one work was executed in less than two months at a cost of 800*l.*, 2228.—There were other plans besides the large one; had better put in the plan giving Mr. Rendel's line at once, 2229.—Will bring before the Commissioners on Monday detailed drawings of the piers; the other works are rubble walls, and things of that sort, which do not require working drawings, 2230–2233.—The Committee know every week that they pay 9*d.* a ton for the stone or chalk, 2234.—The works are formed upon shifting sands, and any estimate must necessarily be very inaccurate, 2235.—The practice is to tell the Commissioners what works ought to be done, and to execute them from time to time according to their directions. The works are exceedingly simple, 2236.—The pier on the south side is a mere rubble pier, 2238.—Will produce the plan of the ground of Messrs. Palmer's, and the licenses, if any, that have been granted to them, 2239.

BROOKS, WILLIAM ALEXANDER, Esq. (*Further Examined.*)—Puts in the following plans, one by Fryer, dated November 23d, 1771, one of the oldest records of the state of the Tyne. An engraved chart of Shields Harbour, also by Fryer, from an accurate survey finished in 1772, and engraved in 1773. A plan

BROOKS, WILLIAM ALEXANDER—*continued.*

of a survey, also by Fryer, in 1787, of Shields Harbour; and several plans belonging to Mr. Rendel, referred to in the Appendix to this report. And witness's large detailed survey of the river above Tyne Bridge, referred to on Saturday, made in 1849. Two plans by Mr. Walker, one showing the proposed piers contemplated by that gentleman, and the other transverse sections of the same. The next is a general plan by witness of the mouth of the river, showing the proposed piers and contemplated alterations; another general plan very much used, 2240–2242.—Has not been able to find the original plan of the application from Messrs. Palmer's, but produces a similar one of the second application, showing the former application on it, 2243, 2244.—The open piles go into the river, 2245.—The staith is land belonging to Cuthbert Ellison, Esq., 2246.—These two plans relate to the staith, and are signed "Joseph Cowen, Chairman, 21st November 1854." Will produce plans of nearly two years prior date, when the matter was under discussion, 2249.—Will produce the originals, 2250.—Will send for them, 2251.—Promises to produce the plan with the pencil-mark of the chairman on it, which was produced at the view when some understanding was come to as to the extent of land Mr. Palmer was to have, 2252–2254.—There was no form of license granted to Mr. Palmer; there is nothing beyond a resolution of the Commissioners, 2255.—It was the practice in the time of the old corporation to consult the interest of the parties, and so they would not stop upon a demand for a staith, 2256.—It was not the general practice on an application to allow the works to go on and at some subsequent time to have formal plans and licenses; those were exceptions, 2257.—The plans are made by the parties who make the application, and witness reports on them, 2258, 2259.—The conservators keep the original plan when it is granted, 2260.—Witness forgets whether there was a report on Messrs. Palmer's application, 2261.—The clerk of the Commissioners will know if there was, 2262.—There have been so many reports altogether, 2263.—With regard to the plan relating to the grant of land, the resolution was come to on the ground by a few of the Commissioners. The only point was as to settling the line to agree with new alterations in respect of the dock; the Commissioners agreed with witness's representation, and it was settled to cut back one of his jetties about 30 feet. There was no reason to make a report, because he verbally reported; the thing was settled, and the line drawn upon the plan upon the ground, 2264–2267.—What witness said was this, that in the upper part, where the deep water existed with a concave side, he had no anxiety to make any enclosure. The 44 acres were urged to be made by some members of the Commission as a trial of the half-tide work; the main part he wished enclosed, 2268.—Has said it was so little essential that there should be a wall between Messrs. Palmer's and Messrs. Leslie's property, and that it should be made solid land; that it might be deferred to any time, that being a part where deep water was existing, 2269.—Heard Captain Purdo make several applications for the area of the encroachments to be furnished, 2270, 2271.—It was nearly a year from the time the first motion was made till it was finally disposed of, 2272.—Thinks it would be dangerous to private individuals to furnish the information; does not think it would be dangerous on public grounds, 2273, 2274.—Never had any objection to furnish it, 2275.—It would have taken a great deal of time and trouble to have furnished the information, 2276–2278.—The old corporation and the Newcastle party in the present conservators objected to the information being given, because prosecutions might be instituted against persons who had encroached, 2279, 2280.—Never had any objection to furnish the information; the cause of the delay was the difficulty of making the return, not having the information, and being so incessantly engaged, 2281–2283.—Does not recollect if that was the reason alleged at a meeting of the Commissioners, 2284.—The plan accompanying the report of 1842 shows witness's original river lines, 2286.—Does not now approve these river lines with respect to Shields Har- 2287.—Has formed no new lines with respect to Shields Harbour, 2288.—The river lines have been virtually agreed to, though there has been no formal resolution to that effect, 2289.—The general principle was agreed to, 2290.—The plan accompanying the report of 1842 contains river lines, 2291.—Those are not the lines now approved of, because changes have been neces-

BROOKS, WILLIAM ALEXANDER—*continued.*

sary, as in the vicinity of Hay Hole Dock, 2292.—That plan does not show the present river lines, because they are naturally changed, 2293, 2294.—The works were in execution in various parts of the river, and when Commissioners entered upon their duties, they never gave any instructions to suspend them. 2295.—At Whitehill Point, witness's line on plan of 1842 very nearly coincides with Mr. Rennie's line. That is a theoretical line for cutting off White Hill Point, which, on subsequent consideration, it would be very unwise to adopt, 2296.—The lines on the plan of 1842 very nearly coincide with Mr. Rennie's river lines, 2297.—Does not think the place called White Hill Point, which appears narrow in the chart, so obstructs the tidal column as many other parts of Shields Harbour, on account of the number of ships therein moored, 2298.—As far as regards White Hill Point, witness adhered to Mr. Rennie's lines. It is a plan which might be adopted when wet docks were constructed, which would supersede the necessity of vessels going in the harbour, as an engineer would wish to adhere to the principle of cutting off White Hill Point, if it could be done without injury to the trading interests, 2300.—This was the standard plan produced before Captain Washington in 1848, 2301, 2302.—That was the original plan; it is in ink, 2303.—That plan contains the works in ink, 2304, 2305.—This is the Commissioners plan referred to, 2306.—There are no soundings or sections on it at all, 2307.—Thinks the plan now referred to is the opposition plan; not by witness, 2308, 2309.—Witness's river line in plan of 1842 nearly agrees with Mr. Rennie's as regards White Hill Point, but at Hay Hill Point it is within the point, and Mr. Rennie's went without it, 2310, 2311.—Did not make a mark on the plan with pencil in the inquiry before Captain Washington proposing to cut off White Hill Point considerably within Mr. Rennie's line, 2312.—White Hill Point was not removed on account of the trading interests, 2313.—Its removal would destroy all the berths on that shore, 2314.—Witness's change of opinion is due to the trading interests and the general interests of the port; if you shoaled up the useful berths you would inflict a great injury, 2315.—Thinks, as engineer to the river, he is bound to take into consideration the trading interests of the port, 2316.—Does not remember seeing a plan of the manor of his Grace the Duke of Northumberland, bearing the name F. Thompson, and dated 1757, 2317.—May have heard the paragraph referring to the plan, but does not recollect it, 2318.—In every plan should lay down a line to cut off White Hill Point, if called upon to produce the best line for the tidal column for the channel, but would feel bound to point out the consequences to the trading interests, 2319.—Was examined before Captain Washington in 1849, on the North Shield Quays and Improvement Bill, 2320.—Witness stated in that inquiry that where Rennie laid down the plan for the improvement of Shields Harbour he did not go on what witness considered the true engineering principles to most effectually remove the insand, 2321.—Witness's plan is generally upon Mr. Rennie's line for Shields Harbour, 2322.—This was the identical plan produced before Captain Washington, 2323, 2324. In 1849 witness's plans, which he was then submitting to the then conservators, the corporation of Newcastle, were submitted to Mr. Rendel for his approval, 2325. The conversation which is referred to as at page 73 of the Inquiry before Captain Washington did take place. Witness has said that his line nearly coincides with Mr. Rennie's. Abreast of the middle ground his line does go beyond Mr. Rennie's, with the object of acting more effectively upon the middle ground and the insand. Believes that is where he refers to Mr. Rennie's plan not being well adapted to act upon the insand, 2326. The plans of 1842 and those produced before Captain Washington have never received the sanction of Mr. Rendel, 2327.—They have never formally received the approval of the Commissioners; but those lines have been materially changed, 2328.—There have been two Committees on the river lines, 2329.—One Mr. Robinson's, the other the Chairman's or Mr. Allhusen's, 2330.—They came to a determination, but the line they adopted cuts off no portion of Hay Hill Point, 2331.—Advocated the cutting off of the Jarrow Slake, on the ground that the channel above might be so adapted that the water excluded from the slake should go up the river, 2332.—The lines have never been adjusted since the plans for cutting off Jarrow Slake and for the Hay Hole Docks received the sanction of Parliament, because witness has not yet got the Admiralty lines, 2333.—Recollects the docks being sanctioned in Coble Dean, 2334.—Coble Dean is the upper part of Shields Harbour, just below White Hill Point, 2335.—It lies between White Hill Point and Smith's Quay, 2336.—When Coble Dean Dock was sanctioned, the corporation of Newcastle required that the dock should come out to Mr. Rennie's line, 2337.—Mr. Nicholson stated, that from the west end of Smith's Quay to White Hill Point a dock was proposed to be formed called the Northumberland Dock.—An Act of Parliament was obtained, and he was engineer for it, and on that occasion he was required by the corporation engineer to adhere to Rennie's line; that is quite true, 2338.—The dock proposed to be erected in Coble Dean was also proposed to be called the Northumberland Dock, 2339.—Witness generally approved of Mr. Rennie's line, and also of the principle of enclosing Coble Dean. 2340.—Mr. Rennie proposed to take a considerable portion, about 200 feet, off White Hill Point; that has not been done, 2341.—Should think Mr. Smith's Quay is about 200 feet within Mr. Rennie's line, 2342, 2343. This is the state of things as regards Shields Harbour; when the Coble Dean Dock was before Parliament, the Corporation required that that company should come out as far as Mr. Rennie's line; but Smith's Quay, which was then building, and has been built since, is nearly 200 feet within Mr. Rennie's line. Witness recommended that this quay should come out, but the parties were unwilling to go to the great expense, and it would also subject them to damages from parties having quays below them; but they were quite willing, if the owners below them came out, to come to a general line, 2344.—Has proposed a great number of lines and schemes, both as regards the South Shields side of the harbour and the docks at the entrance, 2345.—Three or four distinct schemes; one involved the making a wet dock at South Shields, in the bight which Mr. Rennie had proposed to enclose, 2346.—Believes he was examined on the inquiry before Captain Washington as to the quay at North Shields, 2347.—Does not recollect that it was thrown out in the Session of 1848 on the ground that it would be expedient to wait till the conservancy question was settled, 2348.—Believes the corporation were the opponents of the North Shields Quay, 2349.—Believes the application for a quay at North Shields was renewed the next Session, 2350.—Thinks Mr. Rendel approved of that quay, and brought it out to about Mr. Rennie's line, 2351.—Witness, as engineer to the corporation, opposed it, and compelled the parties to reduce it in extent one half, and about 40 feet in width, 2352.—Does not know that the Admiralty approved of it; it was considered advisable for the shipping to deepen the channel and allow more ships to lie there; has been influenced by his own plans given for the formation of piers at the mouth of the harbour, having determined that the river lines should be close to the lighthouse, and new works in the formation of piers rendering that change capable of being carried into execution safely, 2353.—Advised that the pier should be set back some 30 or 40 feet beyond Mr. Rennie's line, and reduced one half in length, 2354.—Does not think that would render it worthless, 2355.—It has not been carried out; believes it is because they have not got money, 2356, 2357.—Witness stated on the inquiry before Captain Washington that he had taken soundings, but that they were not recorded upon any plan, 2358.—Considered the soundings useless, as the sands were changing their form so rapidly, 2359.—Had taken some tidal observations and some velocities of the current, but had not recorded them, 2360.—Took Mr. Rennie's statement that the datum was a dead level throughout, between the sea and Newcastle Bridge, 2361.—In 1850 witness had soundings of Mr. Comrie, 2362.—In 1842, made his observations on the velocity of the current, by observing objects passing down, and timing them with a watch between two points, 2363.—That was the state of things in 1850. They had got the information by Mr. Rennie, given on his plan, as to the rate of the current, 2364.—In the House of Commons in 1849 objected that where the stream is oblique, a cross section would not give the true power of the current in that part of the river, 2365.—Witness stated that he had told Captain Washington that cross sections were quite unfit to test the capabilities of a river, 2366.—Had taken observations in floods in passing down, and had access to Mr. Rennie's plan, showing the rate of the currents,

BROOKS, WILLIAM ALEXANDER—*continued.*

2367.—Asserted to a Committee of the House of Commons, in reference to the shoal across the river, that nothing but the longitudinal sections would give a correct idea of the state of the river, 2368.—Believes Mr. Rendel was examined at the same time, and he had cross sections under examination, for the sake of ascertaining the capacity of the river, 2369.—States in report of 1842, an expenditure of 17,000*l.* would give 17 feet of water to Newcastle, 2370.—No mention was made of dredging in that report, 2371.—Will lay before the Commissioners a statement of the amount of money that has been spent in dredging, between the time of the report in 1842 and the present time, 2372.—Went to London to the Admiralty with Mr. Clay and the Chairman on the subject of the piers; does not recollect Mr. Robinson being present, 2373.—Mr. Clayton has conducted the correspondence with reference to the piers, 2374.—At the meeting of the Commissioners on the 18th of August last there was a suggestion that Mr. Comrie should be employed to take soundings, 2375.—Mr. Clayton gave him instructions to take them in the same line, 2376.—Witness was present, but did not give any instructions different from, or in addition to those given by Mr. Clayton, 2377, 2378.—Had nothing to do with the reduction of the soundings to present them on Mr. Rendel's chart, 2379.—Recollects that on the 18th of August a Committee was appointed to conduct the proceedings before this Commission, consisting of the chairman, Mr. Rayne, and Mr. Allhusen, 2380.—Witness advised an immediate survey to show the existing state of the river, 2381.—Does not think it was on the same occasion that Mr. Allhusen gave a notice of motion that Parliamentary power should be applied for to obtain authority to apply the proceeds of land to the funds of the Commission, 2382.—It might or might not have been compulsory, 2383.—Has given no advice to the old conservators on the subject of compulsory powers to deal with the landowners, 2386.—Has produced three plans of Mr. Rendel's, and a chart of the river with the soundings on it made for Mr. Rendel in 1849, 2387.—Received them first, when Mr. Rendel sent them with his report, 2388.—They were represented by the Town Clerk to the Commissioners, 2389.—Has had them ever since, except when they were in possession of Mr. Comrie, 2390.—Witness made the pencil lines recently, tracing the contour lines, to put them on a small plan, 2391.—Has used the chart of Mr. Rendel's for the purpose of tracing the pencil lines upon it, 2392.—Has also used it for showing the moorings in Shields harbour, 2393.—It is an original document of the greatest value, 2394.—Thinks it perfectly right that a document which cost the conservators several thousands should be used in that way, 2395.—It is a manuscript original, 2396.—Is not certain whether Mr. Rendel has a copy of the document in his possession; believes it is the bonâ fide original, 2397.—Witness has stated that he has laid down the moorings on this, 2398.—Has one or two other plans which show the moorings, 2399.—Has a tracing showing the moorings laid down, 2400.—The moorings for north Shields were laid down on another plan, and transferred to point out where the ships lie in the harbour at the present moment, 2401.—These plans have all been frequently shown to the Commissioners, 2402.—They were delivered in by Mr. Rendel and examined, and might have been inspected at any time, 2403.—There are besides documents containing tidal observations and cross sections, 2404, 2405.—Mr. Rendel accompanied his report with tidal observations, 2406.—Witness produces the same, 2407.—Also produces tidal observations showing the direction of the current, 2408.—Believes Mr. Clayton has a list of these papers with the original report, 2410.—Witness received such as he had from Mr. Clayton, 2411.—Witness produces some tidal observations of his own, but they are not complete, 2412.—They are not sufficiently advanced to be able to put them in, 2413.—They were taken under witness's direction, 2414.—Has some other tidal diagrams taken at a much earlier date than those produced before the Houses of Commons and Lords in the Jarrow Dock Bill, 2415.—Witness saw the diagram produced before the Committees of the Houses of Lords and Commons on the table on Saturday; did not produce it himself, 2416.—Stated on that inquiry that it was a higher tide than ordinary, and selected for showing the influence of Jarrow Slake, 2417, 2418.—Has not made any calculation as to the cubical capacity of the river; Mr. Rendel has and can give evidence on that point, 2419, 2420.—Has never ascertained the quantity of tidal water that will be displaced by Jarrow Slake, 2421.—Thinks that by reason of Jarrow Slake being a sort of bulb from the main channel it would, if cut off, enable a better column to be propagated much more readily up the river, 2422.—Remembers the passage in Mr. Rennie's report with reference to the lines of contraction laid down by him, 2423.—Recollects also a passage alluding to the probable alteration of the places of some of the jetties, 2424.—Witness states that in the deviations he has made, he has, as far as practicable, and for the interest of the trade, pursued the principle of the lines laid down by Mr. Rennie, 2425.—Should think about half or a third of the coal shipped on the Tyne is shipped at South Shields, 2426.—The cutting off of White Hill Point would have put a stop to the working of the collieries, and inflicted immense damage, 2427.—In following out Mr. Rennie's suggestions, has always had in view that works which ought to be done first are those which tend to direct the river in a straight line where it is most interrupted by sand banks, 2428.—Has attended to the observation of Mr. Rennie, that where the channel of the river is to be materially cleansed it should be done practically, otherwise it will impede the navigation, 2429.—Has adhered to these views of Mr. Rennie as closely as he could, 2430.—There is a depression of the low-water depth higher up the Tyne; the water ebbs out to a lower level than formerly, 2431.—That will be proved by the tidal observations, 2432.—Witness has not put in anything which shows it, but will do so, 2433, 2434.—States that the jetties used in the Clyde were full tide jetties, 2435.—Half-tide walls were adopted, but afterwards raised to full-tide walls; witness made a report on the subject to the Tees Navigation Company in September 1853; was sent in that year by the Tees Navigation Company to the Clyde, and made tracings of all the plans of the Clyde, and copied their reports and reported thereon, 2436.—The works on the Clyde commenced from Glasgow downwards, 2437.—Recommended the same principle to the conservators of the Tees as he has been carrying out on the Tyne, 2438.—The conservators of the Tees are not interested in the land except where they have bought the land to make a cut, 2439.—Was altogether independent of any question of interest, 2440.—The works on the Tees commenced at Stockton and went downwards. Works commenced in any other way would involve a much larger outlay, 2441.—Mr. Rendel made the following observation in his examination on the Tyne Conservancy Bill on the 5th of June 1849: "Generally speaking, I have not "the slightest grounds for objecting to Mr. Brooks' "lines; but there may be some cases in which, if the "thing has to be gone over again, you would suggest "some alteration; but I think they would be very "trivial," 2442.—Sir William Cubitt was examined on the same occasion, 2443.—When Sir William Cubitt was questioned on all the material variations from Mr. Rennie's lines made by witness, he stated in every instance that they were decided improvements; they effected the same object with much less expense, 2444.—The effect of Mr. Rennie's works at Willington Quay was to throw the Corporation into the greatest difficulties, 2445.—The result of witness's deviation was to counteract the mischief produced by Mr. Rennie's works, although not effectually, 2446.—Mr. Straker was present on the occasion of the visit of the Commissioners to Messrs. Palmer's ground, 2447.—Mr. Stevenson and Captain Purdo were also present, 2448.—The object on the Clyde is not to make the flood waters maintain a deep still water canal up to Glasgow, 2449.—Considers that there is a comparison between the Clyde and the Tyne as regards the works for improving the navigation, 2450.—The witness produces soundings taken by himself upon Hebburn Shoal; they are all reduced to Mr. Rennie's datmu, 2451.—Was always ready to produce plans of the Tyne and records of measurement by Mr. Giles, Mr. Comrie, and Mr. Calver, when called upon, 2452.—They have always been accessible to parties interested, 2453.—The information respecting the Tyne is really accessible. It would not do to allow every stranger to come in from curiosity to examine the documents, 2455.—The intention of those who drew up this Act of Parliament was, that the Commissioners should be at the expense of compiling and publishing such documents upon the scale of six inches to a mile, and that the public generally should be enabled to obtain them at the simple cost of 1*s.* each. It has not been done, but there have been no complaints of its not having

BROOKS, WILLIAM ALEXANDER—*continued.*

been done. Has had no application from any person for any map of the kind ever since the Act was passed, 2456.—Asserts that in the presence of Captain Purdo. If Captain Purdo had brought a motion forward the matter would have been discussed, 2457.—The expenditure in dredging has been mainly, for many years back, in keeping open the coal staiths on each side of the river. There has been very little dredging indeed in the main channel; the dredging in the main channel has been the exception. Shall be able to place before this Commission a calculation of the number of cubic yards and of material that has been displaced, as comparing the state of the river in Rennie's time and at the present moment between the lines now occupied by the works, 2458.—In the plan delivered in by witness in 1843, his lines, as compared with Mr. Rennie's, were then, as now, in ink. Mr. Rennie's lines and witness's lines are there, 2459.—Generally speaking, those lines on that plan have not been altered since, there have been no erasures; is sure they are as they were, 2460–2462.—That plan has been produced upon public occasions; there can be no mistake about it at all, 2463.—It was produced before Captain Washington; it has been produced upon almost every inquiry with reference to the Tyne, 2464.—And that has been kept at the office of the Commissioners, 2466.—It has not often been used before the Commissioners. A fresh plan has been used, generally speaking, the plan which the counsel has in his hand at present, made about 1849, 2467–2470.—The plan generally used between 1843 and 1851 was that previously referred to, which was laid before Captain Washington, 2471.—This plan consists of the sheets of Mr. Rendel's engraved plan, mounted together, and formed into a general plan, 2472.—The river lines were laid upon this in 1851, 2473.—They deviated very little from the river lines of the plan of 1843, 2474.—It was used on all the river views; it was produced at almost every meeting of the Commissioners, 2475.—Has considered those lines as, practically speaking, settled; they have been referred to upon applications for licenses, 2476.—Those river lines upon the engraved plan are what witness proposes shall now be adhered to, 2477.—The only exception is the arrangement of the lines for the docks. Produces the Admiralty plan, showing the line for the Northumberland Dock. There are three lines laid down upon the plan, 2478.—The line as settled by the Admiralty for the Hay Hole Dock is very nearly upon the blue line upon the engraved plan, but not exactly upon it, 2479–2481.—The blue line witness had previously drawn for the dock; Mr. Rendel had drawn a straight line, 2482.—The introduction of the Admiralty's modified line for the Hay Hole Dock would involve altered lines on the south side, 2483.—They are not yet shown upon this general plan, because witness is waiting for it to be fixed by the Admiralty, 2484.—Believes the Admiralty have already fixed the line of frontage for a portion of the Jarrow Slake, but has it not in possession, 2485.—This line, laid down again in 1851 upon this standard plan of the Commissioners, and nearly all the lines projected by witness, show a cutting off of Whitehill Point, 2486, 2487.—There are several coal staiths on that point, 2489.—Belonging to lessees under the Duke of Northumberland, 2490.—As regards the value of property at that point, there is no reason why it should not be cut off; but there is a reason as regards the value of property in Shields harbour, 2491.—Believes the effect of Whitehill Point is to throw the current of the ebb upon the south shore; that is, through Shields harbour, and to produce deeper water there than would be the case if Whitehill Point were cut off, 2492.—Thinks the effect desired might be produced by leading the river line fairly from Hayhill Point to Whitehill Point, and then off again in any other desirable direction, 2493–2495.—Whitehill Point forms an exception to every other part of the river, which formerly stuck out and interfered with the line of the river, simply on account of the existing interests in South Shields, the loss of berthage that would ensue. If witness would have provided docks sufficiently to supply the water, then he would have cut off Whitehill Point, 2496.—To direct the current from Hayhill Point across to South Shields with the least possible interruption to the velocity of the water, thinks it would be best to draw a line from Hayhill Point to Whitehill Point, provided there were no alternative at a future time of cutting off the point itself, 2497.—Thinks it would be desirable to leave Whitehill Point as a temporary projection to drive the water over to South Shields, but

BROOKS, WILLIAM ALEXANDER—*continued.*

with the prospect hereafter of cutting it off, and making a fair line of the river, 2498.—Dared not cut it off under the existing circumstances of the trade of the port without providing dock accommodation, 2499.—The South Shields people would cry out if the point were removed, 2500.—The point has deepened the harbour on the south side, 2501.—The object in leaving it is to have more ships lying on the south side of Shields harbour. Frequently notices have been sent to parties at the different staiths, desiring them not to send any more ships to Shields Harbour, as it was so crowded that it could not hold them, 2502.—The object is to scour out a deeper harbour at South Shields, and have more berthage room, 2503.—There is a great quantity of coals shipped; it has been already stated that one third of the entire quantity is shipped on the South Shields side, and that is the great reason, of course, for preserving Whitehill Point, 2504.—The principle of the works now in progress throughout the river is that of contracting the river to a channel, generally speaking, in the direction of the river lines, and to do that by means of projecting groins at right angles, forming solid ground from the present high-water mark up to the river lines, travelling in a quay from one end of the river to the other eventually, 2505.—That has always been the principle proposed from 1843, except the dock, 2506.—It has frequently been publicly avowed on occasions which prove it. It was a mere question of time how soon the spaces so inclosed would become land, 2507.—The removal of some of the projecting points, such as Bill Point, formed part of that system, supported very strongly by witness, 2508, 2509.—And carried out by him under the orders of the Commissioners. The deposit of ballast was all carried to the level of high water; in many parts of the river ballast works were going on, and they were all raised to the level of high water, or three feet above high water, 2510.—In making that solid land witness's opinion has been solely given with reference to the increased value to the navigation, 2511.—Believes it would be better to concentrate the power of the water more effectually upon a given channel between high water walls, 2512.—The freshes are the governing power in the Tyne. When they are coming down, they run continuously for the whole period of the flood tide in a great portion of the river; the tide does not make up, even in Shields Harbour; it is so very often, 2513.—This only occurs during very heavy floods; perhaps not more than four or five times a year, where they run completely down, 2514, 2515.—The current runs so strong that it is quite impossible that the tidal wave could run up in the part to which witness is alluding. Believes the velocity to be certainly four knots an hour, 2516.—It is not a fresh water stream altogether; the two powers are united, 2517.—On Mr. Calver's plan, which has been laid before this Commission, there is a statement as to the discharge of the freshes during a land flood, as observed by him at Newcastle. It shows that during the entire duration of the tide, both ebb and flow, the water only fell six inches at Newcastle, and ran down continuously; it stood at 14 feet 6, or 6 inches below the datum tide at high water, and 14 feet at low water, 2518.—It does not appear to have been a very extraordinary flood, because the flood only rose to the level at Newcastle of six inches below the datum tide; a heavy tide would be above that, 2519.—Thinks he should correct his answer, and say that six or seven times in the year at least they have the high-water level at Newcastle Bridge. Mr. Thomas John Taylor has given the amount of fresh water, 2520.—Has observed these facts as to the great power of the discharge of the freshes; has observed them also in Shields harbour, 2521.—In the works below Newcastle considers that the tidal element must also be brought under consideration; they must be both conjoined, 2522.—Thinks the fresh water has the preponderance, as regards its influence in keeping open the deep channel during its power, 2523–2526.—The general effects throughout the year must be more produced by the tides if an average is taken. The general result is greater as produced by the heavy freshes, 2527–2529.—Forms his opinion from observing the great effect produced by heavy floods in driving away the sandbanks, which during the strongest equinoctial spring tides, with no fresh in the river, remain precisely in the same state even in the lower part of the river above Shields harbour, 2530–2532.—Thinks that that applies as far as Shields, at all events as far as Hay Hole Dock, 2533.—Witness's

Brooks, William Alexander—*continued.*

opinion is that the bed of the river remains tolerably unaffected by the tidal water, but that as soon as freshes come it is deepened, 2534.—The flood tide brings a great quantity of sand into the harbour, 2535, 2536.—Knows it from seeing the effects produced by the flood tide upon the sand at the mouth of the harbour. The sands in the bed of the river are all alive on the flood tide, 2537.—Believes it is principally marine sand in the lower part of the river; it appears to be the same as the sand found on the sea-shores, 2538, 2539.—Has not taken any particular means to ascertain the fact beyond a close inspection; that is not a considerable degree up the river, 2540.—The parties who bathe can feel the friction of the sand upon their legs. Can easily point out upon the plan the deep channel made by the flood tide, 2542.—With reference to the important question as to the relative powers of the ebbing and flowing water, believes it is a fact that the bar rises or becomes more silted up after a succession of dry weather, and becomes worse, 2543.—The bar is better after heavy freshes, 2544.—The heavy freshes produce more effect upon the sands than any tide, even the highest equinoctial tides. Has himself visited the quays of Newcastle, when flooded, and the water in the cellars, 2545.—Believes the great bed of the river Tyne must have been originally due to some great convulsion of nature, and that it subsequently filled up with marine sand, and partly with the material from above, 2546.—Believes the great feature in the formation of all these rivers is from these great geological phenomena. Does not believe it possible that any flood tide could have the effect of making out a channel for a river; it certainly must be due to the backwater, or rather the tendency of the flood tide would be to bring material into the river. The fresh water in the Tyne acts very much more energetically than the tidal water. Whenever a fresh comes down the river there is always great alarm in Shields harbour as to the damage from the fresh, and harbour master gives instructions to extra-moor the ships, to secure them to the shore, in addition to their moorings, 2547.—No doubt there are tidal estuaries in the sea, the mouths of which are kept clear solely by the flow and reflow of the tide, 2548.—It depends upon the form of the bay as to whether the tide could keep open a channel, or whether it would bring the sand in and fill it, 2549, 2550.—On the convex shore, at Gateshead, there was a mud and sand bank of considerable extent; it extended over towards the north, and when a fresh came down it was carried out almost like a wall, 2551.—Will assume that after a fresh the river is generally improved, 2552.—The river is generally improved from top to bottom, as far as regards the navigation, by the effect of a great fresh. Should say the improvement lasts at least a month, 2555–2557.—An improvement is always felt where the current of the ebb takes a true course; that is a well known fact, 2558, 2559.—Believes every man accustomed to navigate the river, a steamboat master or pilot, would state that after the freshes they have a greater depth of channel, 2560.—You find the benefit of it longer than a month. The river is better during the winter time than in the summer; during all the winter months the navigation is much better, excepting some points where the current of the ebb has a bad direction, or a direction not fitted to act upon the sand at that spot. Is aware of the value of tidal water, and looks upon his works as tending to produce a greater depth of tidal column in the channel than could possibly exist in the river if allowed to wander from side to side. It must be remembered that tidal water comes in at every tide, being produced by the depression of the low-water surface, 2562.—Has taken means for ascertaining whether there is any improvement in the tidal wave of the river, 2563.—Self-acting tide gauges have not been affixed at different parts of the river, but they have been watched by observers; they have only one self-acting tide gauge fixed in the river, that is at the Low Lighthouse. It does not belong to the Commissioners, 2564, 2565.—The observations of that gauge are not sent to witness. It belongs to the Trinity House, 2566.—It would only show the case at one particular point, and that witness can fully ascertain by his own constant observations, 2568.—Is constantly making observations as to the effect produced by the works, 2569.—Two sets of spring tides were taken this last year, the best of the tides. Should observe that one good tidal observation in a pure state, that is to say, when there is no disturbing cause from fresh water in the river, is worth a hundred as regards

Brooks, William Alexander—*continued.*

the tidal column when it is mixed with fresh water, and that witness has generally endeavoured to get, 2570–2572.—Three such are equal to pretty nearly a hundred of the others; they are of very little use if there is fresh water in the river, 2573.—Always endeavours to take them when the river is in a very dry state. 2574.—The levels of the points are ascertained upon tidal gauges, which are set to one uniform level, and they are watched every five minutes; the watches are set, and witness and his assistants are going up and down, either by steamboats rapidly, or by the railway, 2575.—Witness states that it stands upon the notes that he did not level up to Newcastle Bridge when he took the original tidal observations, but has now levelled up to there. Thinks he made his observations in 1846. Did not level then, 2576.—First levelled in 1849. In witness's observations of 1848 the gauges were all set by observing the high-water line, 2577.—Somewhere about 1849 or 1850 carried the levels right up to Hedwin Streams, 2578.—Has observations taken once or twice a year, at 15 or 16 different points, by 15 or 16 different observers, 2579–2581.—As a result of these late observations, should certainly say that the low-water mark is certainly lowered at Newcastle Bridge, 2582.—Shall be able to prove it by documents, 2583.—Does not find that the tide is raised, 2584.—It is lowered a foot at Newcastle, about 9 inches at Bill Point, about 4 inches lower down, 2585.—Strongly admits the great importance of increasing the quantity of tidal water, 2586.—Is aware that the amount flowing up the river is considerably diminished by the resistance at Bill Point, 2587.—Has examined the tidal observations of Mr. Rendel, and gone thoroughly through all his papers, 2588, 2589.—If Bill Point were removed in the present state of the navigation, or before the discharge of the freshes had increased, believes it would only bring up the sand again. When the Bill Point was originally cut down, it was cut down to about 18 inches below low-water mark of spring tides; the sand dries, 2590.—That was before those groins were put. The St. Anthony's or Bill Point jetties were commenced in October 1847, and finished in November 1847, 2591, 2592.—Thinks it is of importance to remove Bill Point further back to a certain extent, 2593, 2594.—The works were commenced by witness's predecessor, 2595.—In advising the order in which the successive works are prosecuted is influenced by those parts of the navigation which more require it. For instance, Bill Point is a very dangerous part, and has urged strongly to have power to effect those works, 2596.—As regards the effect upon the bed of the river, the various works which have been undertaken since 1847 have been more important than the removal of Bill Point, 2597.—At one of the last meetings of the River Lines Committee its further removal was recommended, but it has not been authorized yet by the general body, 2598.—The shoals in the river mostly consist of sand, 2599.—Has principally dredged sand at the coal staiths; never recommends dredging when allowed to construct works to drive the sand away, 2600, 2601.—Some of the old shoals consist of coals and ballast. For the Sardinian frigate to go down early on the tide—because going down with a falling tide, of course, is more dangerous than coming up with a flowing tide—there was a bank consisting of ballast and coal dredged to a greater width than is generally requisite for vessels which go down the river, 2602.—The Shields ballast keelmen are much in the habit of throwing ballast into the river above Shields, which must certainly add to the material supplied for the shoals, but not materially. Has observed heaps of ballast standing above the water even. Every exertion is made to punish parties for it; the harbour master gives notice to the proprietors of the wharfs; the Commissioners' attention is directed to it on their river views, and parties are brought up and fined, 2603–2609.—The chalk alongside some of the quays is worth half-a-crown a ton, therefore it is not very likely to be thrown into the river, 2610.—There are several works down the river where chalk is visible; at St. Anthony's Reach, the chalk is bare at low water, but that is in a sheltered situation, and does not believe the rubbish goes away there, 2611.—Has the cost of dredging, which is about 9*d.* a ton, 2612.—Parties can be fined for allowing rubbish to go into the river, 2613.—Believes part of the fine goes to the informer, 2614.—Does not think there is any considerable quantity under the wharfs and staiths along the river which would be washed away. One or two quays are in parts of the river not

BROOKS, WILLIAM ALEXANDER—*continued.*

liable to be acted upon by the current, 2615.—It is the harbour master's duty to direct the removal of rubbish thrown into the river, therefore it is his neglect, if any, 2616, 2617.—Cannot say the general amount for dredging between 1843 and 1850. It will be found in the dredging returns he produces, 2618.—In 1854 it was between 3,000*l.* and 4,000*l.*, and previously was about the same, 2619, 2620.—The expense for river works between 1843 and 1850 was about the same; the total cost for river works and dredging between 7,000*l.* and 8,000*l.*, 2621–2623.—There have been no jetties made recently, which has caused the diminution in the amount for river works since 1850, 2624.—Altogether they have not cost more than the 17,000*l.* which witness estimated, 2625.—In 1851 only expended about 1,300*l.* in river works; in 1852, about 2,100*l.*, and in 1853, about 2,200*l.*, 2626.—Prior to 1851, from 1843 up to 1850 inclusive, the expenditure was about 4,000*l.* a year for river works and quays, 2627.—Apart from the dredging, the total expenditure was very nearly 8,000*l.*, 2628.—From 1843 to 1851, expended nearly 4,000*l.* a year on river works, 2629.—From 1851 to the present time have dropped down to 1,800*l.* The works have not been ordered by the Commissioners; there has been so much dispute about the progress of the works, and so much opposition raised by a part of the Commissioners to any further works, 2630.—If the majority determine to act upon their own opinions, they may soon finish them; but there is evidently a desire to conciliate the opinions of the minority as much as possible, and that has had a great effect in retarding the works. Thinks it would be more desirable for them to act upon their own opinions, 2631.—It will take a good many years to complete the river works which are contemplated; at the rate which is now going on, about ten years, 2632, 2633.—Is quite satisfied the groins which remain to be made could be made in a couple of years, 2634.—Nearly the whole of the groins are made. In the parts of the navigation where witness proposes to enclose bights it must be done eventually by quays, which would be executed by private individuals, but the pure river lines might be executed in two years, 2635.—There is abundance of material on both sides the river, 2636.—The want of funds has partly retarded the progress; but thinks the Commissioners have power to borrow money, 2637.—There have been heavy amounts to pay for parliamentary contests, 2638.—Feels it is his duty to effect the dredging at as cheap a rate as possible, 2639.—Generally estimates it at 9*d.* a ton upon the average, 2640, 2641.—Does not think it could be done at half the price, 2642.—The great expense is the maintenance of machinery and craft, and the deposit of material, 2643.—The hire of keels and the getting rid of material costs 9*d.* here; does not think it is less in other rivers. In the Clyde it costs more, or at all events about the same, 2644.—The system of dredging is quite different in the Wear. They use a mere ballast machine that is close to the harbour's mouth, and carry it to sea in these hopper barges at less expense than in the river Tyne. In the Tyne the system is cutting a uniform channel, and endeavouring to make a level bed, 2645, 2646.—That would account for the difference in the actual cost of dredging, 2647.—The published accounts of 1853 furnish the means of estimating pretty nearly the cost of dredging, as distinguished from the cost of lightering, 2648.—The cost of raising and getting rid of it is high, on account of having hired craft, 2649.—Dredging higher up, in the lightering and handling of craft, would make a very great difference in this river. The Act of Parliament provides that none should be delivered within two miles from the bar, 2650.—Witness states that if he were allowed to deposit all the ballast dredged between the groins, could get rid of it much more cheaply; it used to be delivered at 1¼*d.* a ton, 2651.—There is a very great objection raised by the members of the board to depositing it between the groins, 2652.—It has to be wheeled out now; deposits it in some places between the groins, 2653, 2654.—States if he had more craft he could get rid of that dredged material at a good deal less cost than he does now, 2655, 2656.—Supposes the average price at present to be 9*d.*, if one could knock off 20 or 30 per cent. from that, it would give a very large additional sum for river works, 2657.—Believes that for three or four years past the cost of dredging has been rather more than double the sum which has been expended on river works, 2658.—3,000*l.* to 1,300*l.* in 1851, 3,900*l.* to 2,000*l.* in 1852, and 4,600*l.* to 2,200*l.* in 1853, 2659.—

BROOKS, WILLIAM ALEXANDER—*continued.*

That is in those three years. Thinks it would be about the same in 1854, as there were the same number of craft employed, and only one dredging vessel. Witness's object, as engineer, is to dredge as little as possible, 2660.—Is obliged to spend 66 per cent. upon dredging of the amount which he has to spend upon his engineering works, owing to the works not having been carried out, 2661.—Therefore it would be very important to diminish that 66 per cent., and increase the 33; the Commissioners are now buying, or about to buy, fresh craft; it has been a subject under their consideration, 2662.—For going to sea, hopper craft; it has been pressed very strongly upon them, but is afraid himself, as an engineer, that there will be a great draught of water, and believes it will be difficult to work them in this river; they will be 9 feet; they will answer very well in the lower part of the river, but not in the upper part, 2663, 2664.—No material dredged up by the dredger has been carried to sea by craft employed by the Commissioners, 2665.—The material taken up by the dredger from the bottom of the river has only been deposited between high and low-water mark upon the shores, 2666.—As regards the ballast from ships is only so far affected by that as it is a source of funds to carry on engineering works, 2667.—Some of the ballast from ships is taken on to the dry land, and there are several establishments where it is put between the groins, 2668.—It is simply the cost of putting it there. No owner of adjacent land receives any benefit from it. The Commissioners consider that they have a right to deposit it for their own works, 2669.—Some of the various prices named as the cost of getting rid of ballast from ships are grants of old date, when the parties received a larger price for the work, 2670.—The grant cannot be made to the party who takes it cheapest, because a licence has been granted which cannot be revoked for a certain number of years, 2671.—Ballast from the ships is not obliged to go in certain proportions to different places; a party who has a licence gets, of course, as much ballast as he can, 2672.—To get rid of ballast from the ships in the cheapest possible way should put it between the groins, to bring the action of the current more rapidly into effect, 2673, 2674.—In that way thinks the whole expense would not be more than 4*d.* a ton, 2675, 2676.—The Corporation only paid 4*d.* a ton to one party, and only 6*d.* to another, 2677, 2678.—Believes the raising the river walls will materially enhance the value of the property behind them, 2679.—It will make valuable land out of that which is now mud, 2680.—The owner of such land would be glad to receive the ballast upon it, 2681.—There are on the table soundings of witness's of 1849 and 1850, 2682.—Lately they were all taken by Mr. Comrie. Witness has not made any this year, 2683, 2684.—Mr. Comrie made surveys and sections in 1849, 2685.—At the same time that witness took the soundings above bridge, 2686.—Has not taken any soundings below bridge since 1849; not a general sounding; there have been no complete soundings of the river below bridge since 1849, except in 1854. The soundings in 1852 did not extend to Shields, 2687.—There are soundings put in below bridge made by witness since 1849, 2688, 2689.—In 1850, 1851, and 1852, that is to say, local soundings in the same line as Mr. Rennie's; in some instances closer in intermediate lines, 2690.—At particular parts, 2691.—At the end of the groins, wherever any material alterations had been made in the bed of the river by the construction of recent works, 2693.—There are soundings over those same places made by Mr. Comrie in 1813, and there are soundings made by Mr. Calver over the same places in 1849, 2694, 2695.—In 1854 there are soundings made by Mr. Comrie, 2696.—A partial sounding made by Mr. Calver, particularly at Hebburn, where they correspond very closely with the soundings made by the late Mr. Comrie. There were soundings made by order of the Commissioners before the works were made at Hebburn. Witness made soundings showing the then state of the river, and the progressive effects are shown, 2697.—The soundings made by both Mr. Comrie and Mr. Calver are extremely accurate, 2698.—If all those soundings were taken as facts, and the averages drawn from them at different periods over those parts of the river where they were in common, it is possible some accuracy of result might be obtained, 2699.—Should be quite satisfied to leave the results to what is shown upon the bed of the river. The soundings will test the value of the operations, 2700.—The soundings made by Mr. Brooks, Mr. Comrie, and Mr. Calver

BROOKS, WILLIAM ALEXANDER—*continued.*

agree very closely; it is astonishing how closely Mr. Calver's agree with Mr. Comrie's generally, 2701.—Is quite satisfied that certain measurements should be made from those average sections, bearing in mind that the works are not even yet completed, and therefore it is not fair to test the value of the works so early. As regards the effect already produced is quite satisfied, 2702.—The plan upon which the works actually executed are laid down, is the general plan which witness laid before the Commissioners, 2703.—They are there in pencil and ink. The sections of 1854 by Mr. Comrie are all down the river, from Newcastle Bridge to the bar, and below the bar, 2704.—They are transverse sections. Repeating all his former soundings in the same position, in the very same lines, 2705–2707. A few places are left out up the bights. This is the only general plan upon which witness introduced the works as completed, 2708–2709.—Is aware that in the mass of valuable papers which Mr. Rendel gave in upon his survey there was a comparison of the sectional area as between 1813 and 1849, 2710.—Has observed that the total cubic contents of the river below low water have materially altered between 1813 and 1849. That they have increased to the amount of 9 per cent. Is getting calculations made now to show that the increase is very much greater, 1849 was too early to test it at all. There has been a more valuable and energetic tidal column brought into action than before, 2711, 2712.—Which will be proved by the tidal wave, if the quantity is materially increased by it up above the river, 2713.—This was the plan by which it was proposed to obviate the objection to cutting off Whitehill Point, and one of the plans for furnishing dock accommodation, 2714.—Believes the total cubical contents of the river, estimated by a comparison of the surveys of Giles, Comrie, and Calver, was very carefully taken at the time by Mr. Rendel's assistants, and believes they were all taken from the datum level down to the bed of the river; that is, assuming that the receptacle was filled up, 2716.—It was done with great care and at great expense. If the true body of water could be ascertained which was thrown into the river in Mr. Rennie's time, as compared with the present time, thinks it would be much more in favour of the works, 2717.—Three years would make a great difference as regards the depression of depth. If you refer to the late Mr. Comrie's survey it has gone down generally from two to three feet in the Long Reach. There has been a great depression of the bed. In 1849 the low water surface was not depressed, because Hebburn Shoal existed in all its bad condition, 2718. —In 1849 Hebburn Shoal acted as a dam, retaining the low water, 2719.—Witness's impression being that the low water section is still more increased, the low water contents should, of course, be calculated from the old low water surface, otherwise in the neighbourhood of Newcastle one foot in height would be lost; in fact all the measurements should be from high water in its true state, not from a datum level, which is only imaginary, 2720. — Believes between 15,000*l.* and 25,000*l.* would put all below bridge in a good train to propagate the tidal column very much better than at present, 2722.—There are very important works above bridge, 2723.—Witness produces a plan of the works which he would introduce; there would be an immense addition to the tidal column if the works were made above bridge. Mr. Rendel also entered fully into this point. 2724, 2725.—Witness gave a rough approximate estimate of the cost of carrying those works out in his report. An estimate was given when the application was being made to Parliament in 1850. Witness planned the works above bridge, and Mr. Rendel planned the piers at the same time; the detail is in the Admiralty inquiry, 2726. — A very small amount, about 21,000*l.*, that is principally for jetties; it would cost more if connected with rubble walls. That 21,000*l.* did not include training walls. The result of these groins (showing the same) was a considerable depression of the bed, 2727, 2728. —There is a very great quantity of sand and material brought down this river from above; it is washed away from the banks by the heavy floods, and also a great quantity of material is thrown in at the lead works where the stone is crushed, but the power of the water is quite sufficient to carry it away; does not find the river any worse afterwards, 2729–2732. — The crushed material would be coarser, and it would not go so far to sea as the fine sand, 2735, 2736.—The flood is such that it carries it away; has never seen it at low water at the bridge, 2733–2738.—Is told there

BROOKS, WILLIAM ALEXANDER—*continued.*

are forty or fifty different workings up there; has not been up to that district, so cannot speak to it, 2739–2740.—Can get evidence upon the point what they will wash out a day; the Commissioners have no power of checking that, 2741–2743.—There is deep water immediately below Newcastle Bridge, but it does not extend to any distance; it is a mere pool caused by the overflow or discharge of the floods, it does not go 100 yards, 2744, 2745.—There is a want of some datum level at mean tide; a mean water level rather than a level starting from a datum at either low or high water, 2746, 2747.

BROOKS, WILLIAM ALEXANDER, Esq.—(*Further examined.*)—Hands in the tidal diagrams. These are observations made in 1854, commencing on the 7th of September and ending October 6th. Produces also reduced charts of the Tyne of 1813, 1849, and 1854. —Produces also two parts of the Tyne, Wallsend Bight in 1813, and the same in 1854. Mr. Webster wished to ascertain the acreage included within the river lines and the shore. Supposing the whole were enclosed, without Jarrow Slake, it comes to 322 acres and eighty-five hundredths. That includes the Hay Hole Docks, which occupy 72 acres and ninety-six hundredths of an acre, and also the enclosure of the convex shore opposite Wallsend Bight, which it was not witness's first intention to enclose. It was subsequently ordered to be enclosed by the Tyne Improvement Commissioners to the level of half-tide. These two should be deducted from the 322 acres, that will leave 212 acres and seventy hundredths of an acre, the original lines being 201. Has also charts of the Humber, the Bridgewater, and several other rivers, which may be of use during the inquiry. Proposes now to enclose 322 acres, as compared to 201 acres, which were in the original lines, 4770.—Is referring to the lines agreed upon at the present day. Witness's lines of 1854 are slight modifications of the original lines of 1842, 4771.— Those lines which give this acreage of 322 acres are laid down upon the plans produced before the Honourable Commissioners at the examination at Newcastle, 4772.—Produced two plans, the plan of 1843 and the plan of 1854, 4774.—The difference as regards acreage between the two plans is between 201 acres and 212, or thereabouts, with the exception of the dock, because the Hay Hole Dock will still remain as water, and the tide will have the power of going through the entrances when required, 4775.—In 1843 had lines laid down in Shields harbour, but has no lines laid down there now upon the Commissioners' plan. This acreage is quite exclusive of anything in Shields harbour. 4776–4778.—This acreage goes down to Hay Hill Point; it is westward of Hay Hill Point, 4779, 4780, —Is now upon the Commissioners' plan of 1854. The width of the river between the walls up at Newcastle is generally about 400 feet, 4781.—Abreast of the old quay it is only 350 feet; it is about 800 feet below the old bridge, 4782.—The walls are not complete at St. Lawrence, 4783.—Opposite St. Peter's Quay, in its natural state, the width would be about 650 feet. There is a bight enclosed there. Opposite the bight, above Friar's Goose Point, where an enclosure is proposed to take place, 4784.—Has not the lines laid down, but, speaking from memory, the full-tide area would be about 470 feet, 4785.—Has not the Conservators' plan. All the plans were put into the hands of the secretary of the Commission, and a certain number were selected, 4786.—Has only these plans with him, but can give any evidence from his knowledge of the river, 4787.— They do not differ materially from his Parliamentary plans, 4788.—This acreage, and so on, to which witness has referred, will apply very nearly equally to the Parliamentary plans and to the Conservators' plans. There is a very slight alteration made. The width is 462 feet. Mr. Rendel's lines of deviation are the same there, 4790. — This Parliamentary plan will show the present high-water surface, 4791.—Takes the present high water at a 15 feet tide. At St. Anthony's Quay, at the point, it is 395 feet, from memory, at the narrowest part, 4794.—396 feet is the present high-water distance, 4795.—It is proposed to cut off there 66 feet. Between the walls at that point it will be 462 feet, supposing the point at the Lead Works is cut off, 4797–4799.—The present high-water surface at Hebburn Quay, opposite low-water at the broadest part, is 957; between the walls, 780, 4802–4805.—The width at the Dean and Chapter land at Wallsend is 1,914 feet, 4806, 4807.—Between the walls 815 feet, 4808.—Has given these areas, but

BROOKS, WILLIAM ALEXANDER—*continued.*

has not given the cubical contents, so as to show the quantity of tidal water that will be displaced. Has not calculated those; that of course depends upon the action which will take place on the bed, 4809, 4810.—Witness has handed in 9 tidal diagrams. The difference of the time of high water at Newcastle and Shields varies very much; it varies from 45 minutes to 55, and an hour and 5 minutes. There are several 45 minutes, 4814.—Gives the difference of time of high water between Shields and Newcastle every day during a month. Believes there has been no record made of the questions which he put to Mr. Rendel in reference to the important sections by Mr. Giles in 1813. Witness observes, that instead of the tides being at a dead level, or rising to the same height at Newcastle as at Shields (as Mr. Rennie's surveys would show), one tide was 10 inches below the level of high water at Shields, and several 7, 5, 4, and 3 inches, and that the datum tide had merely been selected for convenience of reference, as being a dead level line. None of these tidal observations show a depression to the extent shown in 1813. The high-water surface at Newcastle is nearer now the level of high water at Shields, 4816.—The tide gauges were levelled by Mr. Comrie and witness; they had observers at a great many stations, 4817.—The gauges were boards about 9 inches in width, and the 15 feet mark was a dead level throughout, carefully levelled and checked over, 4818.—The boards were divided into inches, and the observers took the tide every five minutes day and night, 4819.—Some of these gauges were the original ones put down by Mr. Comrie in 1849, and not altered since. They have been since examined and levelled by witness himself; Mr. Comrie's last soundings were taken from the same marks; they were generally spiked into the ends of the jetties, 4821, 4822.—Witness can vouch for the perfect correctness of the gauge at Newcastle, 4824.—These observations are equally correct. There may have been a few discrepancies found, where the men have left their posts from fatigue or cold, but there witness has put dotted lines, 4825.—Where there is a derangement of the tide, there is a notice of a fresh being in the river at the upper part where the tide ran down during the entire time of the flood tide, 4826.—There are several observations in the books as to the state of the river at that time. Witness can put in the original documents if wished, 4827.—With the exception of one, those observations generally show that the river has been tolerably free from freshes, 4828.—At Newcastle it will be found that the low-water surface is about a foot lower than the old state of the river, 4829.—Upon these charts will be found copies of the books kept at Shields, and, looking at the high-water surface, will be seen the state of the wind. The Shields Harbour Master's Assistant gives the tides exceedingly well, 4830.—It is put in the chart in pencil, but can put in the original books.—4831.—Shows on the chart the tide of the 23d September. The wind was north-west, and then above is put in pencil from the book a record in detail about the time of high water, and then the low-water surface also. These observations at Shields were taken by a very careful observer, 4832.—There is no similar memorandum as regards the state of the river fresh at Shields, but occasionally as to the state of the river as to freshes, 4833, 4834.—It is only mentioned when there is evidently a fresh, 4835.—The dock water might be used to scour with, but, as a professional man, should not recommend it, 4836.—The time when Mr. Comrie made the survey was when the river is generally lowest, in the autumn, September and October, 4838, 4839.—Should say it is not then liable to freshes. Many observations which witness has taken in the summer months show quite as low a level at Newcastle; has some showing only 2 feet 4 upon the gauge at Newcastle, 4840.—These observations were made whilst Mr. Comrie's soundings were going on, 4841.—This handwriting is witness's and his son's. It is to be observed from many of these tide gauges, that when there is quite a foul ebb at Shields, there are lower ebbs at Newcastle than there used to be upon a very clean ebb at Shields, 4842.—These are the original documents made out from the books. Witness has no copies of them, 4843.—The only diagrams laid down from Mr. Comrie's are those of 1849, and they form a part of Mr. Rendel's Appendix. Witness has taken them in a different way, 4844.—These diagrams of 1854 are laid down by witness and his son, not Mr. Comrie, 4845, 4846.

BROOKS, MR.:

Extract from pamphlet entitled the "Reply of Mr. Brooks to Mr. Calver's Letter to the Commissioners in 1846," *Calver*, 1646.—Witness has laid down a plan of Mr. Brooks' for piers in 1845; that plan would be quite a different one to the plan of Mr. Walker as now projected, *Murray*, 4728.—Brooks' lines were submitted to Mr. Rendel for his approval, *Brooks*, 2325.

BROWN, LEONARD. (*Analysis of his Evidence.*)—Is a down river pilot from Bill Point, 3140.—Has been a river pilot 18 years, 3141.—Considers the state of the river for navigable purposes much improved as compared with former years, 3142.—There is from 2½ feet to 2 feet 9 more depth since first made a pilot, 3143.—From Bill Point to Whitehill Point, 3144.—The shoals have been removed, and the channel has improved, 3145.—Where those shoals were, the depth is from 4½ feet to 4 feet 9. In taking a ship down, 4½ feet more than the rise of the tidal water is allowed, 3146.—When first a pilot, had 9 feet, 3147.—The channel is a great deal straighter. From Wallsend to Whitehill Point it does not vary more than half a point, which is a great improvement upon olden times, 3148–3150.—On the 2d of December last piloted the "Bullfinch" from Pelaw Main to Whitehill Point, drawing from 15 feet to 15 feet 2 water; after that she went direct to sea. The tide was flowing about half-past 2 or 3 o'clock, 3151, 3152.—It was two or three days before the best tide, 3153.—Is appointed by the Trinity House of Newcastle, 3155.—Is not a freeman of the corporation of Newcastle, 3156.—It might be an improvement to take off Whitehill Point. It would give a straighter course, 3158.—Sees Whitehill Point marked upon that map, 3159.—There are some staiths at Whitehill Point, 3161.—The Duke of Northumberland has some staiths there, 3162.—Sees the blue line beyond the red, 3163.

BULBS:

By cutting off bulbs you increase the momentum, *Rendel*, 4355.

"BULLFINCH:"

On the 2d of December last piloted the "Bullfinch" from Pelaw Main to Whitehill Point, drawing from 15 feet to 15 feet 2 water; after that she went direct to sea. The tide was flowing about half-past 2 or 3 o'clock. It was two or three days before the best tide, *Brown*, 3151, 3153.

CALVER, EDWARD KILLWICK, Esq. (*Analysis of his Evidence.*)—Is a surveying officer in the employment of the Admiralty. Attends in pursuance of instructions from the Admiralty. Has been engaged as a surveyor continuously since 1836, 1568–1570.—Was first engaged in the Tyne in 1838, 1571.—Witness states his duty, as assistant surveyor, was to survey the shores of the Tyne at the entrance, to receive the soundings made by the party to whom soundings were entrusted in that survey, and to abstract the documents, 1572.—Visited the Tyne again in 1847, in common with other harbours on the east coast. Made inquiries as to the particular character of the port, 1573.—In 1849 was residing at Sunderland, and then the conservancy contest was commencing between Shields and Newcastle. On the application of the Shields people they suggested to the Admiralty that some independent officer of their own should be sent over to take certain testing sections upon the river Tyne. Was the party appointed for the purpose. The engineer on each side was directed to furnish witness with a certain number of sections, which they wished to be taken, and Captain Washington, who had been the inspector, also suggested a certain number of sections. Took 16, pretty equally divided, between the lower part of the river and Newcastle for the Newcastle engineer, 16 for the Shields engineer, and 19 for Captain Washington, 1574.—At that time was taking sections, such as were pointed out by the engineers of Newcastle and Shields, and by the Admiralty, 1575.—In 1849 gave evidence entirely in favour of the view taken by the engineer of the lower part of the river, 1576.—As a mere rapid examination, witness states those different sections were sufficiently accurate to enable him to compare the transverse sectional areas as they then existed at different parts of the river; but immediately after witness entered upon a legitimate survey. This was merely for

CALVER, EDWARD KILLWICK—*continued.*

operations in the spring; but when the Bill was lost (as witness understood from the session coming to a close) on account of the contradictory statements which had been made, it was considered judicious, on the part of the Admiralty, that witness should go down to the Tyne immediately after the session ended, and make a complete survey of the whole river, from the bar up to Newcastle Bridge, taking Mr. Rennie's survey as a basis. Mr. Rennie's plan was very perfect (details the plan). There were two distinct examinations in 1849; one only for a temporary purpose, in the spring, and the other was really an elaborate, careful survey, 1577.—In addition to these examinations in 1838, 1847, and two in 1849, has also partially re-examined it from Hayhill Point, opposite to, at that time, the proposed Jarrow Dock, to above Hebburn Quay, in June last. In addition to that, in the interim between 1849 and 1854, visited it on one or two occasions to make reports upon works, or the probable effect of works, 1578.—The quantity of solid land that was formed within the tidal basin since Mr. Rennie's time amounted to 95 acres. Nearly the whole of the 95 acres are expressed by the black portions of that diagram. (Witness pointed out the same.) That is other than the red, 1579–1582.—Knows nothing about the ownership of that land, but knows the names of the places, 1583, 1584.—Witness states that he ascertained the quantity of tidal water entering the Tyne in Mr. Rennie's time, and according to his own observations in 1849 there was a loss upon a spring tide of 34,261,000 cubic feet below the datum of the surveys. That was the loss on a spring tide; if it were a smaller spring the loss would be in proportion, 1585–1589.—As regards the length of the sailing channel there was only 390 feet difference in the whole length of the channel between Shields Narrows and Newcastle Bridge, 1590.—As regards the mean depth of the sailing channel, took in each of Mr. Rennie's sections the deepest water upon that section, and also took the deepest water upon his own sections; and the sum of all Mr. Rennie's was 7,143 feet; witness's 6,957, showing a mean loss of eight inches upon the deepest track of the river, the figures being 24 feet 4, and 25 feet, 1591.—Made a comparison of the width of the sailing channel at certain depths, 1592.—Ascertained the first interruption in a four-feet channel; a vessel drawing four feet would be interrupted at the lower part of Jarrow Slake, 1593.—Gives the names of the principal isolated banks which were dry at low water. In Mr. Rennie's time they amounted to 99 acres: in 1849 they amounted to 104, being 5 acres more, 1594.—Compared the low water area in Mr. Rennie's time, and in 1849. Every section was calculated; there were 286 low water sections, 1595.—Has no means of comparing the amount of low water surface at the period of Mr. Rennie, and in 1848 or 1849, 1598.—North Shields Harbour, from the Narrows to the New Quay, which is in fact all North Shields Harbour, had decreased 34 feet in breadth, and 2 feet 11 in depth, 1599.—The part which witness has called the throat of the port is the part of the navigable channel between the Middle Ground, or the continuation of the Insand and the Low Light Beach, where one of the Royal Commissioners was examining, 1600.—Thought as an index of quantity it was useful, and measured the navigable channel there at low water, 1601.—Witness states when he measured the breadth from the point of the Middle Ground to the Low Light Beach he did not go upon Mr. Rennie's sections, but upon the contours by his sections. Did not get the capacity of the throat of the port by measuring by the sections, because they would not cut across; the throat of the port might be between the two sections, 1602.—Found a decrease of 30 to 40 per cent. in the low water capacity of the throat of the port, 1604.—The bar in Mr. Rennie's time was 6 feet deep; in the Admiralty survey it was 6 feet 8, being an increase of 8 inches as regards depth, 1605.—The sectional capacity for the sailing channel over the bar has decreased nearly a quarter part since Mr. Rennie's time, 1606, 1607.—Saw some old plans of 1771 and 1782, and 1800, during the conservancy contest, and the average depth of the bar was 8 feet 6 inches. In the Admiralty survey, on which witness was engaged in 1838, the depth was 8 feet 3 inches, 1608, 1609.—The depth in the Admiralty survey is a more valuable record than that upon the old plans, 1610.—The witness's examination was principally from Hay Hill Point to the upper part of Hebburn Quay, 1613.—Found the general condition of the navigable channel in a distinctly inferior condition, compared with what it had been in 1849. The dredger in June last was working upon a shoal which did not exist in the Admiralty survey of 1849, 1614, 1615.—(Witness pointed out the same.) Witness states that at the inspection of the river the other day, when he went down the river with the Commissioners, at Black Staith certain soundings were being taken. When the Royal Commissioners got down to this point, the steamer in which they were embarked was put from side to side of the channel to draw the attention of the Royal Commissioners to the beautiful channel which existed there. If you look to the similar channel in Mr. Rennie's time you will, as a matter of comparison at any rate, not find an inferior one, 1616.—The shoal at which the dredger was at work is not a mere spot; it is a large feature in the navigable channel of the river; it is an altered condition of the bed of the Tyne, 1617.—As regards the breadth of the river at Hebburn Quay, found that it had varied. The following works had been introduced (witness here enters into particulars), 1618.—The depth of water over that shoal had increased 1 foot 10 inches at Hebburn Shoal, 1619.—The breadth of the sailing channel was diminished 40 feet from a little distance below Headon Ballast Quay down to the lower part of Jarrow Quay since 1849, 1620, 1621.—Observed a confirmation of the correctness of his examination in the shape of notices from the harbour master, attached to the ends of the staiths in that part, warning vessels not to lie more than two abreast; thinks in consequence of the narrowness of the channel abreast of them, 1622.—On the occasion of the Jarrow Dock Bill made a comparison of the state of the bar in June 1854 and in 1849, sufficient to satisfy himself as to the depth over it, to enable him to give evidence before the House of Lords, 1623, 1624.—Refers to entry in pilot's book on June the 12th, 1626.—The bar, as sounded by witness on the 14th of June, had 21 feet 8 upon it, and the entry in the pilot's book of June the 12th would be 22 feet. The bar does not vary materially; it is a broad flat bar, and has an even depth, 1627–1629.—The pilot's book is with a 16 feet rise of tide; but witness allows 15 feet rise of tide; it is not exactly the same comparison; it is sufficient for witness that it is 7 feet at low water. It is a question of fact how far the bar was at that time below a certain datum line. Of course it is not an absolute spot, and is not varying like high water; merely states that the pilot's book gives 22 feet, witness's 21 feet 8 inches, 1630.—These entries are consecutive fortnights; but in the middle of the summer the bar does not vary at all, 1631.—The upper plan shows in different colours the different states of encroachment at different periods, describes what the different colours on the plan represent, 1632–1634.—Gave the black solid land since Mr. Rennie's time, up to 1849, at 95 acres. Speaking from memory, thinks the other portions were 34 acres in addition, 1635.

CALVER, EDWARD KILLWICK, Esq., R.N. (*Further examined.*) States by what process he arrived at the calculation that upon comparison between the years 1813 and 1849, the loss upon the spring tide, as compared with Mr. Rennie's estimate at high water, was 34,261,000 cubic feet. The result of a comparison of the sections showed the river, considered simply as a receiver for tidal water, had decreased one twenty-second part in capacity, 1637.—Did not base his calculation on the supposition that the tidal receptacle was filled at the same time at the bar and at Newcastle. No tidal receptacle is full at the same time; it is impossible. Assumed that on account of Mr. Rennie's celebrity as an engineer he would make a proper calculation of the amount of tidal water admitted into the river, 1638.—The time of high water on an average spring tide at Newcastle Quay, after Prior's Rock, which is a little outside of Shields Narrows, is one hour and three minutes, by witness's observations, and also by Mr. Brooks'. Therefore that shows you that the receiver cannot be full at the same time. The calculation upon this matter has been disputed by Mr. Brooks. He has published the grounds upon which he disputes the accuracy of witness's calculation upon this point, 1640–1642.—Has seen a pamphlet entitled the "Reply of Mr. Brooks" to witness's letter to the Commissioners in 1852. Addressed a letter to correct the misrepresentation, 1643.—Witness here reads a passage in which Mr. Brooks charges him with having based his calculation on the supposition that

CALVER, EDWARD KILLWICK—*continued.*

the tidal receptacle is filled at the same instant of time. Witness states his calculation is open to all; he is ready to explain it to the Royal Commissioners, 1646. —In making a comparison, assumed that Mr. Rennie, as an eminent engineer, had made a correct calculation of the tidal water admitted. The only way that witness could establish anything like a comparison as to contents, which is really one of the most important things, was to treat it simply as a receiver, and finding that the receiver had decreased one twenty-second part, the only mode he could adopt was to say that the contents of tidal water had decreased one twenty-second part; it is the only comparison that can be made, 1647.—Assumed that Mr. Rennie had made the necessary deductions for the effect of the tidal wave, 1648.—Did not make the deduction, but took Mr. Rennie's figures after he had made, as he assumed, the necessary deduction, 1649.—It is now five years ago, and witness was extremely careful, as it was such an important thing, to use every precaution so as not to misinform in giving this comparison, 1650.—If he had ventured to predict the mode of Mr. Rennie's calculation, it would have led him into error, 1651.—His business was simply to make a comparison with Mr. Rennie's tidal contents, 1652.—Assumes Mr. Rennie's calculation to have been correct, 1653.—Wishes to be understood that he did not make these deductions, assuming that Mr. Rennie had made them, 1654.—Knowing the time of high water to be so different, it was distinctly necessary for Mr. Rennie, in calculating the total contents, to ascertain that fact, but not necessary for witness, 1655, 1656.—The low-water surface is the same in both cases; there is no deduction; there was a certain amount of tidal contents above that low-water surface, 1657.—Has not connected the tidal phenomena of the two sections of the river, to say as a fact, that when it is high water at the bar, it is only just beginning to flow at Stella (witness referred to a section.) This has no connexion with the comparison with Mr. Rennie below Newcastle Bridge, to which part his calculations were confined, 1658–1661.—Supposing Mr. Brooks is correct in stating that this error got into witness's calculation, as a difference of level, the error would be greater as the stations advanced up the river, but not greater as to water contents, 1662.—Gave evidence in 1850 upon the Tyne Navigation Bill; recollects saying, as a simple matter of opinion, that if the low-water surface at Newcastle " was lowered to the low-water surface at Shields, his " impression was that there would be a fair equivalent " in the extra current for the amount abstracted from its " sides," but still it must depend upon calculation, 1663–1665.—If the low-water surface above bridge was lowered, that, as a matter of principle, would produce the same effect; the only way to make a restitution for anything abstracted from the sides is to lower the low-water surface and raise the high-water surface; and if there was the same quantity between those low and high-water surfaces as there was originally at the sides, the condition of the river would be better, 1666.—That low water would come in every tide; and another feature is, that it would be travelling over the main navigable track of the river, 1667.—That would be an improvement, 1668.—Admitted upon that occasion that an impression had been made upon the low-water surface at that time; further explained it as too trifling for calculation, 1670. —With reference to the sailing channel, took the deepest water on his own sections, and found a mean loss of eight inches in the deepest track of the river, 1672,—Distinctly there were not more shoals and sharp points and holes in the time of Mr. Rennie in 1813, than in 1849, 1673.—Witness's survey shows that there was shoaler water opposite Bill Point then than in Mr. Rennie's time; admits it was a better navigation in 1849, 1675, 1676.—Is aware that Bill Sand has gone away from the reach above Bill Point. It has gone mainly to a hole a little below it; it is probable witness may inadvertently have called it a hole, 1678.—Between the four feet north and the four feet south at low water there was a four-feet channel over the place where Hebburn Shoal formerly was, of 185 feet wide; there was no four-feet channel in 1849, 1680.—Hebburn Shoal has been deepened 1 foot 10; add that to 3 feet 4, by the protrusion of those groins, contracting the width of the river, 1683, 1684.—Speaking from memory, it was 3 feet in Mr. Rennie's time, 1685.—Hebburn Shoal was 15 feet below datum in Mr. Rennie's time; it now admits vessels to Newcastle drawing 1 foot 10 more, 1687.—Walker Sands,

CALVER, EDWARD KILLWICK—*continued.*

which existed, and are shown upon the chart, in Mr. Rennie's time, are now removed (shows were they were), 1690.—Witness here points out Wallsend Bight. The river was very narrow there in Mr. Rennie's time, but not narrower than it is at present, 1692.—The character of the new channel opposite Coxlodge is so altered that the breadth cannot exactly be compared; it may be a little wider than it was in Mr. Rennie's time, 1694.—The channel has been straitened, the bight has been reduced, 1696.—The deepest water of the river would be more secured by a gently curved channel than by a straight one; the deep core of the navigation, 1698.—The straightening of the river renders the distance shorter, but there are other circumstances to be considered, 1699.—Was present part of the time during the evidence given by Mr. Straker, 1700.—Practically, in 1849, the sailing channel was the same, 1701.—In 1854, merely made a partial examination of the main estuary; compared with 1849, it is greatly inferior, 1702, 1703.—It is inferior in its character as a navigation, as a whole, 1705.—Hebburn Shoal has been removed, but the channel, treated as a whole, is narrower. Jarrow Shoal still remains, and, compared with the exact condition in 1849, an additional shoal has been created, 1706.—Upon Jarrow Shoal, without respect to Jarrow Shoal being in the exact position of the river, there were 3 feet 9 in June 1854, 1708.—Has marked it in the chart, 1709.—There is no deeper track a little more to the north, 1710–1714.—With respect to the sailing channel in 1813, a vessel drawing four feet water could proceed from Shields Narrows, a distance of 28,000 feet, without interruption; and in 1849 the same vessel would be interrupted at the same black spot marked Jarrow Slake, 1716, 1717.—Such a vessel in 1813 would have had to pass Howdon Shoal, 1718.—(Witness pointed out the same.) It is where it is marked four feet, 1719. —13 feet 9 the lower end, 13 feet 6 the upper end, was the range of tide from low water at each end of Jarrow Quay in 1849, 1721.—Mr. Brooks commenced sounding at a particular part of the river, and afterwards these soundings were continued at the request of witness; during the taking of these soundings the same feature was crossed, which witness terms the new shoal, 1724. —There is a question about the depth of those soundings, between 6 feet 3 and 6 feet 9; 6 feet 9 at that time of tide, 1725, 1726.—Since that there were 3 feet 4 at the tidal gauge immediately opposite, without knowing what the value of the guage was as to level, 1727.—Assuming that gauge to be correct, (but it is a matter of figures, and witness cannot immediately refer,) assuming the gauge to be 6 feet 4, it is 18 feet; but assuming it to be 6 feet 9, it is 18 feet 6, 1729–1733.—The rise of tide in 1849 was 13 feet 6, 1734.—These surveys were made in June last, 1738.—Has not made any examination of dry shoals; his examination was simply confined to the navigable condition of the channel, not with any particular reference to any dry sands, 1740.—Has made no examination of nice quantities between his examination of June last and his survey of 1849, 1741.—The low water area from the upper part of Hebburn Quay to the lower part of Jarrow Quay is the principal part, and that has decreased 40 feet in breadth. Should say simply, as a matter of opinion, that the whole area was less at the present time than in 1849, 1743.—Should say the channel is deeper between those limits, taking the average, but 40 feet narrower. One must be taken with the other, 1744.—Has not seen the survey of the Tyne by the late Mr. Comrie made in last September, 1748.—Witness made a perfect survey in 1849, but his examination in 1854 was confined between Hay Hill Point and Hebburn Quay, 1750, 1751.—As the bar is one of the most important subjects connected with this river, has mentioned amongst other subjects for comparison the reduction of this quarter part in the sectional capacity of the bar, 1754.—The expression " sectional capacity " as applied to the bar, means the length upon the ridge of the bar, multiplied by the depth, 1755.—The sectional capacity of the sailing channel over the bar has been the subject of witness's comparison, 1756. —Has read the book by Mr. Brooks, in reply to a similar charge made by witness previous to the year 1852, 1759. —Upon witness's attention being called to the following passage,—" I shall now close my remarks on this division " of his letter, by stating very plainly that Mr. Calver " has greatly misrepresented the sectional area of the " discharge of the water of the Tyne, as it appears " upon his own recent survey. I state that he has

CALVER, EDWARD KILLWICK—*continued.*

"not given you the breadth between two similar "points, as he tells you he has done,"—states that he made comparison between similar points; can describe the course. The bar shifts in character, and he must assume something on either side to measure the sectional capacity; but has assumed exactly the same system of determining the sectional capacity of the same channel over the bar at the two times of comparison, 1760, 1761.—The length of the district of comparison in 1849 was 1,250 feet roughly. Multiply that by 6 feet that would give a sectional area of 7,550 feet within that breadth at low water; has given it in evidence, 1762, 1763.—The section between the Spar Hawk and the shore had nothing to do with the bar. Was merely comparing the navigable track over the bar, 1764.—In 1849 there was a channel of from 4 to 5 feet between the Spar Hawk and the shore, but not connected with the navigable track over the bar. There was a little channel between the Spar Hawk and the shore in 1849 of from 4 to 5 feet, 1766.—The length of the section from the 3-feet contour line to the shore is 800 feet, 1767.—The information which witness gave to the Royal Commissioners, and on which he expressed an opinion in 1849, was as to what he called the capacity of the navigable channel at the bar. But besides that, there was another outlet through which water would escape or go in, but not suitable for navigation, 1768–1770.—Never made a calculation of the section at the bar for the purpose of discharge simply, 1771.—If treating it as a question of discharge simply, the proper place to make the calculation would be at the Narrows, because it is subject to only one disturbing force, which is the current, whereas the bar is subject to two, the wave and the current, 1772.—The bar of 1849 was 6 feet 8 at low water, 21 feet 8 at high water; the bar of 1854 was 6 feet 8 at low water, or 21 feet 8 at high, exactly the same at the two periods, 1773.—The general breadth was the same, 1774.—With reference to the question of tidal receptacle, assuming that the high-water surface were raised and the low-water surface depressed, it is the difference between those two that gives the tidal quantity each tide, 1777.—States opinion with reference to this question, that transverse sections are of far more importance than longitudinal ones, because in a transverse section you get the contents of the tidal receiver, 1779–1781.—At the beginning of the season in 1849, in the observation which witness then made, was employed by the consent of the Shields party, the Newcastle party, and the Admiralty, to measure particular sections which they pointed out, but his elaborate survey was by order of the Admiralty for their own information, 1782.—As regards this question of the tidal receptacle, the results which witness has given are derived from the summation of the sectional areas at the two periods upon the sections which he has taken, 1783.—Witness's per-centage of loss is independent of absolute quantities, 1784, 1785.—The per centage of the water is not affected by the shoals, because the subject of comparison, the tidal water, is above the shoals altogether; it is only affected by the works at the side, 1786.—All the shoals in the river are not entirely below low-water mark, 1787.—Those shoals are liable to vary very much between low-water mark and their highest point, 1788.—Referring to the acreage of shoals, it is not exactly horizontal, because the low-water surface of the river is an incline, and witness has a certain gauge there which tells him where he is to commence the comparison, and he determines from the bottom of that gauge, 1789.—Makes no allowance for incline in the calculation upon the plan, 1790.—It is not a matter depending very much upon the surveyor's personal opinion, as to where a certain shoal begins and ends; it is a matter of actual observation, 1791.—The only shoals which witness has measured were when the water was exactly at Mr. Rennie's low-water datum. When the water was at Mr. Rennie's low water datum, all the shoals which were then dry at low water, witness has taken the area of at the two periods, having already stated that the low-water surface has not been affected, nor the high water. The high water is still a dead level, and there is still the same difference of level between Newcastle and Shields, 1792.—With reference to Mr. Rennie's datum level, as a matter of memory, his low-water gauging was the low-water incline of a certain tide. Is not immediately certain of it. Knows the high water was, 1793.—States the whole comparison was referred to the 15 feet datum line in all cases. Having found that Mr. Rennie's low-water surface was unaffected, of course took the same rise at that part to reduce it down to low water, 1794.—The tide observed on the 31st of May, though not an average spring tide, as it rose 14 feet 11 inches, is that which was taken as a datum for all the soundings marked on the plan. That tide of the 31st of May is that marked on the south-west corner of the Low Lighthouse at Shields; every measurement in the river, whether of shoals, channels, tidal contents, or anything, was referred by witness at the two periods of comparison to this datum level throughout the river; an absolute level, 1795.—That tide was not an average. Mr. Rennie mentions it particularly in his survey, that he was forced, in order to save time, to assume a certain level, because he could not perhaps take an average till the summer was over, 1796.—The level which Mr. Rennie established here had reference simply to the Tyne itself, and not any levels on either side of it. It was judicious to leave on record a certain datum to which future examinations of the river might be referred as an absolute line, 1797.—Everything which witness offers with respect to the Tyne has distinct reference to this 15 feet, whether in 1813, 1849, or at the present time, 1799.—Speaking of the general question, possibly there is a degree of uncertainty thrown over the assertions of various parties, on account of their measuring from three different points, 1800.—When the tide rises to the 14 feet 11 inches at Shields, it rises to the same level, 14 feet 11 inches, or 15 feet at Newcastle, 1801.—Of course, at a subsequent period of the tide, it is an hour and three minutes afterwards. It rises to the same height exactly as it was in 1813; 1802, 1803.—States that all the rivers on this coast, the Tyne, the Wear, and the Tees, rise to a dead level; the Severn is an entirely different case, 1805.—The object being to make the river as efficient as possible for navigable purposes, an increase of depth, provided it has sufficient width for ships to pass up and down, would be an improvement if it is in connexion with a strict preservation of the quantity, because they are two questions entirely, 1808.—The river being wide enough to admit of ships passing up and down, an increase of depth simply would be an advantage to any vessel passing from Shields to Newcastle, 1809.—With reference to the drainage of the country of which the Tyne is the great drain, has read Mr. Taylor's work on the subject, and also the evidence which has been quoted before previous committees of the amount of drainage, as far as it has been hitherto estimated, of the area of the district of country through which the Tyne flows, 1810, 1811.—In Mr. Taylor's work the calculation has been gone into rather elaborately, 1812.—If the bar were deepened, and the flow of water facilitated each way near the mouth of the harbour, the ingress of the salt water, and the outfall of the fresh water would cause an improvement in the navigation of the upper part of the river. It would be advantageous for the stream of the river, that the mouth should be widened as well as deepened, especially at the Narrows, 1814.—Is not aware of any reason why for the last 40 years no efforts have been made to improve either the mouth or the bar of the river. States as a matter of opinion that if they had attempted to improve the Narrows in the present state of the river, they would have failed, because it is due to certain causes which cannot be done away with, and any attempt to attack the effect is lost labour. Refers to the Narrows themselves. When the piers which are intended to be erected at the mouth of the Tyne are formed, the Narrows themselves will be improved by that very operation, 1815.—Knows no reason why no effort has been made to improve either the bar or the harbour, except the impracticability of it, 1816.—The increase of deep ships lying at Shields would certainly be an advantage to it, and as a matter of commerce, to Newcastle also, 1817, 1818.—As a commercial transaction, having got ships to Shields, it is very superior, having them at Shields than at Newcastle, 1819.—Very deep ships can only go into Shields Harbour at present: north and south Shields is the deep portion of the Tyne at the present moment, 1820.—Ships of a moderate draught can go up to Newcastle, 1821.—If half-tide walls had been formed from the first in the river Tyne, the remainder of the basin between the half-tide walls and the shore would have been maintained as a part of the tidal basin, nearly in perpetuity, with a little careful conservation, 1822.—Of the silt and the ballast, &c., which at present tends to fill up the space behind those half-tide walls, the coarse portions are kept in

the mid river, the finer portions go into the quiescent parts of the current; but allowing for a deposit on an incline, the wave in high winds, and the agitation produced by steam paddles, would be sufficient to deal with it, 1823.—That is, after the banks behind those half-tide walls have grown up to the level of the half-tide, 1824.—But the very fact of the establishment of these half-tide walls, still retaining a heavy amount of tidal scour within them, would remove, as a matter of opinion, the banks, and generally improve the navigation between them, so as to give an equal amount of tidal water; it would scour off the surface sands between the tidal walls, and one should be put against the other, being both in the tidal region, 1825.—The material out of the channel there, would go behind those walls for a certain time, till it had filled up to the top of the half-tide wall; after that, it is witness's opinion that it would remain permanent between the wall and the shore. Found that upon his experience of the Tyne and other rivers. This great Jarrow Slake in an interval of 36 years had not altered at all in height of surface, neither by witness's examination nor Mr. Rendel's, 1826.—The general level of Jarrow Slake being about half-tide, as a matter of silting upon Jarrow Slake, does not think the half-tide wall would have any effect upon it, 1827.—Looking at the length and bulk of these half-tide walls, their effect has been to displace a very large quantity of tidal water up to the present time, 1828.—The bulk of all these works taken together displaced a great amount of water up to 1849, it displaced what witness gave in evidence. The 34 acres of solid land which witness mentioned yesterday have displaced a very great quantity of tidal water, 1829.—After the water has risen above the level of those walls it does not spread from one side to the other, because at every short distance this is bounded by certain quays, called transverse groins. It is made still water, and the deposition is very quick, and in course of time the deposition, from having these still places to go into, becomes dry land, which is not the case witness is assuming, namely, that the half-tide walls are carried out properly, and that the whole of the dry alveus of the river between that and the original shore is kept entirely unaffected by staiths and such things in a river like this, 1830.—If a half-tide wall be carried from one end of the shoal to the other, and communication be cut off from the current of the river, it will form a pen or weir, and will rapidly fill up a triangular space between the shore, the top of the wall, and the bottom of the wall; but after it has arrived at that point it will remain permanent from the causes already mentioned, 1831, 1832.—Has witnessed very heavy freshes in this river, 1834.—Witness has an observation of a very heavy fresh at Newcastle, but unfortunately has not the same at Shields to join the two. The maximum was 25,200 feet per hour, that is 5 statute miles, 1835–1837.—The power or velocity of the River Tyne, when a heavy fresh combines with an ebb tide running through Shields Harbour, would be greatly increased over the common circumstances of the tide, 1840.—The rate would be at 4 knots; 4 nautical miles, 1841.—Has heard it stated that it runs 6 knots and upwards; does not believe it, 1842, 1843.—Thinks that the removal of the old bridge, and the building of a bridge with an arch of very wide span would improve the whole navigation of the Tyne. It would have a particular effect upon the tidal propagation. Shows the reason of that opinion, 1845.—A curved river line is better than a straight one, 1846.—Supposing that the passage of water completely filled the channel, so as not to admit of eddies or delays in any part, simply as a matter of transmission, believes that a straight channel would be better, because a straight channel implies a decreased distance; but a straight line, on the other hand, would be inferior for navigable purposes, 1847.—The reason of that inferiority being that water always has a tendency, upon meeting the least impediment, to try to avoid it, and, therefore, in channels where the bottom is of an unequal character, it shoots from one side to the other to get on as fast as it can, 1848.—That is the present effect; but the object being to get as deep water, and as uniform a depth, and as straight a line as possible, the most perfect channel would not be straight and of uniform size; for this reason, if your straight river was of any breadth, you would have no security for the maintenance of the deep water channel of that river in any one position; but if you give a slight bight, you then retain for ever your channel for the navigation of the river exactly in the same spot, 1849.—Let the quantity of water passing in the channel be large or small, a curved channel in every case, as far as navigation is concerned, is superior to a straight one; but considered simply as a conductor for the transmission of water from one part to the other, a straight channel is superior, because there is less friction, 1850.—Steam navigation gets the advantage of the deep channel the same as any other, 1851.—The great object at present is to maintain the port and the bar, and to do that, the tidal contents must be retained. That is the first thing for a judicious conservator in an important river like this to take notice of. Then the second one is the transmission of vessels from Shields (the port, which is eminently valuable to the public) to the higher part of the river, to the parties who wish to receive the vessels; they are two independent questions altogether, 1853.—If the Tyne depended upon tidal water only for its depth, if there were no land floods, if there was no great drainage of country carried out to sea through the Tyne, the value of the tidal water would of course be inestimable, 1854.—But looking at it as it is at present, it being a mixed question of the combination of tidal water with fresh water, the principle of straightening or curving the course of the river, while producing certain levels, and making certain alterations, becomes a very material one. In the case of the Tyne those two branches of the subject are very distinct indeed. The great question which must always be kept in view, for the benefit of the locality and the public in the Tyne, is the public port and the bar; then, in order, the interior navigation of the river, 1855.—Took no soundings in the Tyne, except those of 1849 and 1854, 1856.—Subsequently to the Admiralty survey, in fact, on the 29th of May last, witness came over here and hired a steamer to enable him to put in the lands formed in the tidal basin since 1849, running rapidly over the river. To do that he got a vessel of light draught at Shields, thinks 3 feet 6. When he got up opposite the place called Wincombe Lee Powder House, which is just below Bill Point, in that part this steamer of light draught, drawing as a matter of memory 3 feet 6, stuck, not in the middle of the river, but a little on one side of the middle. Took soundings where she was, and compared with the depth, and found there was a distinct difference from the Admiralty survey of 1849, 1857.—Has no means of making any other comparative charts of parts of the river, except at Jarrow, and shows diagrams of that part, 1859.—With respect to the comparison, all those soundings are taken from Mr. Rennie's plan, 1860.—Mr. Rennie's soundings are taken to inches; it is a most beautiful survey, 1861.—It is exactly 4 feet; if it had been more than 4 feet should have added the inches; they are given to inches in beautiful detail, 1862.—The difference between that and the later period; it is the difference between 4 feet and 3 feet 9 in the one case, and 3 feet 10 in the other, at that part of the examination, 1863,—In every case has corresponding sections with Mr. Rennie's, 1864, 1865.—Can give high and low water; can divide them into sections of six. The first six sections are opposite to the Herd Beacon, agreeing with No. 1 marked on the lithographed Admiralty Survey. Mr. Rennie's high-water section No. 1, is 16,253; in 1849 the same high-water section is 15,935. No. 2, proceeding upwards, Mr. Rennie's 15,253; 1849, 16,625. No. 3, Mr. Rennie's, 18,161; 1849, 18,700. No. 4, Mr. Rennie's, 27,170; 1849, 24,483. No. 5, Mr. Rennie's, 25,160; 1849, 19,800. No. 6, Mr. Rennie's, 24,310; 1849, 21,164., 1866.—They correspond with Mr. Rennie's, assuming the same high-water mark, 1867.—The velocity with respect to the tidal wave up to Bill Point, was 13 miles per hour, 1868.—That diminished to 8 immediately up to Newcastle Bridge, 1869.—And it then increased immediately beyond 22¼ to Leamington, 4½ miles in twelve minutes, 1870.—Should draw the conclusion from that rapid increase of the tidal wave, as between Newcastle Bridge and its upper point, that Newcastle Bridge is proved to be a part of the cause of obstruction between Bill Point and Newcastle, because the resistance of Newcastle Bridge would act as a cause for some distance below, 1871.—Ascribes the immediate increase beyond Newcastle Bridge to a wide tidal receiver, and a comparatively straight navigation; it opens out immediately you get above the bridge, 1872.—In this case the increase of the velocity of the tidal wave is owing to the increased width of the tidal basin, 1873, 1874.—The whole of this diagram is constructed from Mr. Rennie's section and the 1849 section repeated, 1875.—Obtained this information from repeating Mr. Rennie's section between these two points (showing the same), 1876.—The chart above shows the channel in 1854, 1877.—Does not think the projection of

CALVER, EDWARD KILLWICK—*continued.*

piers would either improve or disimprove the river within the Narrows; does not expect they would make any alteration in the amount of tide admitted or rejected, 1878, 1879.—As the erection of piers would correct a confusion of sets which exists at the present time, thinks there would be an improvement, especially in the flood set, 1880.

CALVER, EDWARD KILLWICK, Esq. R.N.—(*Further Examination.*)—Has the soundings from which the chart of the channel was made in 1854, 1985.—Produces the soundings, and states those supplied to Mr. Brooks are those in red ink on Mr. Rennie's line, but they are only about half of what witness took. They must needs be on Mr. Rennie's line for the sake of comparison, 1986, 1987.—Points out the soundings which form the data on which the 3 feet 9 shoal is shown, 1988.—The witness explains the chart to the Commissioners, 1989–1998.

CHALK:

Messrs. Palmer denied having put down the 15 tons of chalk, as reported by Mr. Brooks, *Clayton*, 3336.—Being worth at the present time 2*s.* 6*d.* a ton, is not likely to be thrown into the river, *Brooks*, 2610.

CHANNEL:

The improvement in the depth of the channel has been effected by dredging, *Poppelwell*, 708.—Thinks the deepening of the channel is partly owing to the steamers, *Straker*, 864.—The sailing channel, as compared now with what it was in Mr. Rennie's time; is inferior as a navigation; gives reasons, *Seymour*, 1705.—Simply as a matter of transmission believes a straight channel would be better, because a straight channel implies a decrease of distance; a straight channel would be inferior for navigable purposes, *Calver*, 1847.—Across the bar is generally of uniform depth, *Comrie*, 1979.—Witness proposes to narrow the channel considerably more than Mr. Rennie, *Brooks*, 2056–2063.—The fresh water has the governing influence in keeping open our deep channels, *ib.* 2524,—Comparing the present condition of the channel of the river between Newcastle and Shields with its condition in former years, considers that it is very greatly improved, *Dunn*, 3234.—Thinks, from experience of the Nene and Ouse, that the amount of tidal water would be increased by straightening and directing as much as possible the channel of the water, *Stephenson*, 4125.—Thinks the irregularity of the channel is an evidence of the irregularity of in-going and outgoing current; suspects that the deposition of sand is caused by the Narrows, and this it is which makes the channel so bad. If the channel were improved above, and if the narrows could possibly be widened, there would be no sand or obstruction whataver, *ib.* 4128.

CHART:

Has the soundings from which the chart of the channel was made in 1854. Explains the chart, *Calver*, 1985–1998.—(Mr. Rendel's.) The pencil lines recently made are witness's; he has also used it for showing the moorings in Shields Harbour, *Brooks*, 2393.

CLAUSE:

An indemnity clause, 53, was introduced in the 1849 Bill, on the third reading, without the consent of any of the contracting parties, *Linskill*, 1056, 1057.

CLAYTON, JOHN, Esq. (*Analysis of his Evidence.*)—Is Town Clerk of Newcastle, 3280.—Is also Clerk to the Tyne Improvement Commissioners under the Act constituting them in 1850; the officers of the corporation were continued in their offices, subject to the same absolute power of removal possessed by the corporation under the Municipal Reform Act of 1835, making compensation to those who held office at that time, 3281.—Remembers Mr. Rennie's survey of the River Tyne, Mr. Giles and his assistant Mr. Comrie being employed upon it, 3282.—Mr. Comrie confirmed witness in his recollection that Mr. Rennie was only once upon the Tyne during the survey, 3283.—Mr. Rennie put his river lines upon the plan in London, drawing his information, no doubt, more effectually from the plan than from an inspection of the river; but not having any knowledge of the manufacturing establishments on the banks of the river, thinks in his report he qualifies his lines accordingly, 3284.—This report was made in 1816, 3285.—Does not think he visited the Tyne between his survey and his report, 3286.—The nautical authorities at the

CLAYTON, JOHN—*continued.*

time did not acquiesce in the report upon the Tyne; they were entirely attached to the theory that Captain Purdo now maintains, that no tidal water ought on any account to be displaced, 3287.—The general feeling was, that matters should be left alone; and as moving would cost the corporation money, they acquiesced cheerfully in that general feeling, 3288.—Remembers the Tyne Main Shoal, though not an engineer, 3289.—In consequence of the loud complaints about its state, about the years 1833 and 1834, the corporation brought down from London a Thames dredging boat or barge, and applied it to the removal of the shoal; but they found the matter removed was soon restored to its former position, and they then attempted an alteration of the shore, in which they were assisted by Mr. Ellison, whose name is a good deal used in this inquiry in respect of his property lower down the river. He was twenty years member for the town, and built a quay upon a line set out by the corporation. They then applied the dredging barge, and after the current had received a direction from the quay the dredging was effectual, and the Tyne Main was, to a great extent, removed; the complaints then ceased, 3290,—It was found the shoal could not be removed by dredging alone, 3291.—On the passing the Reform Act in 1835, the reformed corporation determined not to let things alone, and appointed an engineer, who proceeded to operate upon the river, 3292.—Mr. Anderson was the first engineer appointed, 3293.—At his death Mr. Brooks succeeded him, 3294.—The corporation took measures for the improvement of the river, 3295.—They determined that they would adopt Mr. Rennie's lines, wherever the existing establishments on the river admitted of it, without incurring a very enormous expense, and where they could not be exactly followed, they wished to adopt the principle of them, 3296.—The landholders were fearful of injuring their river frontage, therefore there was a difficulty in getting any landholder to allow the corporation to commence operations in front of his property, 3297.—Having considerable property of their own, they commenced in front of that property; a good deal of it was let on leases, and they have had serious claims for compensation from their lessees, as well as from other parties, 3298.—The question of title of the corporation to the soil of the Tyne is at present in an uncertain position. The Crown, according to Lord Hale, in his treatise "De Portibus Maris," claims the soil of all navigable rivers, so far as the tide flows. In the Tyne the Crown has exercised no right to the soil of the river, the corporation claiming a title derived from the Crown to that soil. For the last 200 years they have exercised this power solely to enforce a proper line of quay by the landholders, not claiming the soil taken out in the erection of those quays, feeling that it would be injurious to the establishment of manufactories on the banks of the river, to interpose between every man's property and the river a strip of property belonging to another. The largest proprietors of lands on both sides the river are the Duke of Northumberland and Mr. Ellison, both possessing monastic lands confiscated by Henry VIII., and passing to laymen, but originally derived by the monastery from the Crown by grant of manors; therefore Mr. Ellison on the one side, and the Duke of Northumberland on the other, claimed the soil, under grant from the Crown, anterior to the title of the corporation, 3299.—When the Bill for the Hay Hole Dock was before Parliament, the solicitor of the Woods and Forests interposed for the Crown, and clauses were put in reserving the rights of all parties claiming an interest in the soil of the river; in consequence, valuers appointed by the Crown, the Duke of Northumberland, the corporation, and the Tyne Improvement Commissioners, have settled the price to be paid out of the dock fund for the land occupied by the dock, which sum is to be appropriated for the benefit of the party who shall turn out to be entitled. The Commissioners of Woods and Forests have proposed that the Duke of Northumberland and Mr. Ellison should submit to the solicitor of the Commissioners of Woods and Forests a statement of their title, and, to avoid litigation, that statement to be laid before eminent counsel, to be agreed upon on both sides. Being concerned professionally for Mr. Ellison, knows that he has had his title before the solicitor of the Woods and Forests eight or ten months since, but does not know whether the Duke of Northumberland has accepted the invitation. It has not been decided among the three contending parties who is to receive the purchase money of the site of Hay Hole Dock, 3300.—The Tyne Improvement Act,

CLAYTON, JOHN—*continued.*

passed on the 15th of July 1850, constituting the present Commission, 3301.—As originally framed, it contained powers for works; but the Committee of the House of Commons expunged those powers. That Committee, after having passed the preamble of the Bill (refers to the Bill promoted by the Corporation of Newcastle), recommended the parties promoting and opposing to meet and agree as far as possible on the details. The opposing parties pressed for the introduction of four Admiralty Commissioners, which was resisted by the promoting parties, as tending to centralization, which is not popular in this country. It was finally arranged, as in clause 13, that four life Commissioners be appointed, giving the Admiralty the power of supplying the places of two when vacancies occur by death or otherwise. The parties not being able to agree upon the division of the representation, it was arranged that the Committee of the Commons, of whom Sir John Yarde Buller was chairman, should hear counsel on both sides, and that the parties should adopt their decision, which produced the representative constitution as it at present exists under the Act. The legal advisers of the Corporation advised them that clause 28 transferred to the new body all liabilities incurred by the late body; but by clause 63, introduced by the advisers of the Duke of Northumberland, who feared the effect of Rennie's line below Willington upon their shipping places, a right of action is reserved against the Corporation in respect of their previous acts as conservators, which rendered necessary, in the opinion of the legal advisers of the Corporation, clause 64, which was introduced in the Lords, 3302.—The four Life Commissioners were substituted for the four Admiralty Commissioners, 3303.—The parties agreed upon that clause, 3304.—A question was raised whether the rolling stock of the Corporation, as conservators, passed by the Act of Parliament of 1850, to the Commissioners. In February 1851 was asked by the Commissioners his legal opinion upon the question, but begged to be excused giving it, and suggested that they should take the opinion of a barrister, naming Mr. Ingham, Member for South Shields, but Captain Linskill preferred some barrister who had no local connexion, therefore witness suggested Mr. Cowling, which was agreed to, and his opinion acquiesced in by both parties, 3305.—In all coal ports it is a great burthen to get rid of the ballast; nine tenths of the ships enter the port in ballast. For the last 100 years the estates of the Corporation at Walker and Willington have been places of deposit for ballast. At the time of passing the Act in 1850, there was no agreement as to terms for delivering ballast, because the Corporation were Conservators, as well as owners of the land and machinery. At a meeting of the Commissioners in 1851 it was agreed to offer 8*d.* per ton, which was accepted by the Corporation, and has been paid to them ever since. The corporation have made a profit of this delivery of ballast, but not to the amount stated, as no charge is entered in the accounts for the capital of the Corporation employed in machinery, which is a depreciating capital of considerable amount. The space at Willington being filled up, the Corporation are constructing a railway to convey the ballast over their own into the neighbouring land, and there will be no profit at all in future. The Finance Committee of the Corporation only continue this ballast delivery for the sake of the trade of the port. The Commissioners receive 1*s.* 4*d.* per ton for all ballast entering the river, and get rid of it as they can, paying larger sums at Shields to Mr. Salmon and Mr. Swinburn than at less expensive establishments. Believes they have shown no favouritism to any one, but have done their duty to the public and their constituents, 3306.—Mr. Rendel had been employed by the late conservators to report upon the improvement of the Tyne, 3307.—The Commissioners did not receive his report till October 1851. He had been employed for two or three years previously, 3308.—The Commissioners determined immediately to give notice of an intention to go to Parliament for piers at the mouth of the river, and for the Hay Hole Dock. This dock occupies a bay, which Mr. Rennie recommended to be entirely excluded from the channel of the river by a half-tide wall. By this plan all the staiths used in shipping coals in that bay (upwards of a million tons are shipped here yearly) must have been extended to the new river line, at a cost of 50,000*l.* Mr. Rendel proposed that that space should be occupied with a half-tide dock; but as the parties shipping coals in that bay said that would be of no use to them, the Commissioners determined

CLAYTON, JOHN—*continued.*

to convert it into a full-tide dock. In order to raise the funds, they arranged with the collieries shipping coals in that bay to do so, when the docks were made, for a given number of years, at a certain rate, which ensured a revenue sufficient to pay the interest of the estimated capital, and to redeem it within a moderate number of years. The Commissioners took power in their Act to raise the necessary money upon the security of these prospective dues. The rates agreed on are so certain and so ample that they have found no difficulty in getting means to go on with the dock, which is in a forward state, and they have effected the improvement suggested by Mr. Rennie without any charge on the river funds. Mr. Rendel's estimate for the half-tide dock was 107,000*l.*, 3309.—The Commissioners considered the piers the greatest object of all, but there was unfortunately a great difference of opinion as to the particular line, no less than seven piers being projected. The Commissioners directed their engineer to lay down what appeared the most likely line to be effectual, and the Act was passed with sufficient powers of deviation to admit of their adopting any of the plans. It received the Royal assent June 17th 1852. Witness communicated with the chairman and some members of the commission, and took upon himself to write to the Lords of the Admiralty, to the effect that if they would approve of the plans of the piers being submitted to Mr. Walker, probably the Commissioners might acquiesce in any alteration in their Parliamentary plan which Mr. Walker might decide upon. The Admiralty accepted this suggestion, and the Commissioners acquiesced unanimously. Mr. Walker visited the spot two or three times, heard the evidence of all parties with great patience, and on the 15th of November 1853 made his report upon the piers, which is before the Commissioners, 3310.—Mr. Walker adopts, with some variations, the Parliamentary plan of Mr. Brooks and the Commissioners, 3311.—The next step was to estimate the cost and to get the working drawings approved of. In December a plan of Mr. Walker's was lodged at the Admiralty. The Commissioners, apprehending the expense would be very considerable, and feeling that these piers would form a harbour of refuge in which the whole country would be interested, a deputation of them attended upon the Admiralty and Board of Trade in March to enforce upon the Government the propriety of aiding them out of the national funds, but they were told it was an unfavourable period to apply. The Admiralty were then pressed for their approbation of the plans and working drawings. Reads letter from the secretary thereupon. Having obtained the assent of the Admiralty to the execution of the works to a certain extent, the Commissioners applied themselves to having the detailed drawings and specifications prepared. They also concluded satisfactorily negociations with the Board of Ordnance and the Duke of Northumberland, owners of the land, necessary to make the approaches to the pier on the north side. They have bought of the Dean and Chapter of Durham 36 acres of rock, near to the site of the south pier, and have formed a railway from that rock to the side of the pier. There has been some difficulty in getting the working drawings into proper form and properly approved of. Reads the last letter from the Admiralty on the subject, dated 22d January 1855, 3312.—The Commissioners have not yet had time to answer that letter. From their construction of the Admiralty letter of the 6th of May 1853, it appears clear that the Commissioners' engagement with the Admiralty terminated by Mr. Walker's report of November 1853. They have since arranged with Mr. Walker to be their consulting engineer, but there is some little misunderstanding about these plans, which will be shortly removed, 3313.—Did not verbally communicate the resolutions of the Commissioners of the 4th of May 1854; delivered a copy of them personally to Mr. Walker, in the presence of the chairman, 3314, 3315.—Captain Purdo's motion of the 8th December 1853, seconded by Mr. Stevenson, was, "That the engineer should furnish a report, showing the number of acres of land that have been abstracted and are under operation of being extracted from the tidal space (by the operation of the full-tide walls and transverse jetties), subsequent to the year 1840, on each side the river between Bill and White Hill Points, including the space sanctioned by Parliament for the Northumberland dock, distinguishing what is already solid land from that under the operation of silting or filling up," 3316.—The resolution was passed without observation or division, 3317. On the 23d of March

CLAYTON, JOHN—*continued.*

1854, page 154, Captain Purdo moved, seconded by Mr. Stevenson, "That no further encroachment be permitted upon the tidal space of the river till the above report be furnished." Mr. Rayne moved, as an amendment, seconded by Mr. Carr, "That the information was of no value, and ought not to be furnished," which amendment was carried on a division by a majority of 9 against 2, 3318.—Mr. Straker was in the majority, 3319.—Reads extract from the Minute Book of the Commissioners on the 4th of May 1854, page 161. That was an application from Mr. Leslie, a tenant of Mr. Ellison, to maintain his communication with the river frontage. The Commissioners have begun to make a half-tide wall, extending down the whole of Mr. Ellison's shores, who, feeling that their object is finally to benefit the navigation, has interposed no obstacle, though he had a considerable space of deep water along that shore; but Mr. Leslie is excluded from his river frontage by a bank of mud produced by the half-tide wall or other works of the Commissioners, who might not unreasonably have been asked to make his communication with the new river line themselves, but understands his application to be that he should be allowed to harden the mud bank produced by the works of the Commissioners between his works and the new river frontage, 3320.—It is a very small space, 3321.—Mr. Straker and Mr. Poppelwell are in the majority for the suspension of the standing orders referred to in the Minutes on the 4th of May 1854, page 161, 3322.—The first letter to Sir James Graham, page 169, was read at the meeting, July 20, 1854, and carried by a majority of 8 to 4. It was a reply to a letter which the minority of the Commissioners had addressed to Sir James Graham on the 3d of June, 3323, 3324.—On the 17th of August a Committee was appointed to prepare for the meeting of the Royal Commissioners, 3325.—That Committee determined to ascertain by re-survey the state of the river to the present time, for the purpose of giving information to the Royal Commissioners, 3326.—Wrote to Mr. Alexander Comrie, who had assisted in making the survey and the soundings for Mr. Rennie in 1813, and had made the soundings for Mr. Rendel in 1849, to ask him to come here and receive his instructions, 3327.—Gave him instructions verbally on his arrival, 3329.—They were pursuant to the direction of the Committee of the Commissioners, who were present at the interviews. The instructions were to repeat all the soundings which he had made for Mr. Giles in 1813, and for Mr. Rendel in 1849, upon the plan of Mr. Rennie. Read to him this passage from Mr. Rennie's report, "The velocity of the current of the flow- " ing tide in springs above Shields Narrows is about " three knots per hour at half flood, and about half " ebb the current is about 3¾ knots per hour." He said he knew that place, that he had made those experiments in 1813 himself. Witness said, " Repeat those experiments and report the result." That was the instruction witness gave Mr. Comrie, 3329*.—Thinks the Commission has worked efficiently, and that Mr. Straker did himself great injustice when he said the devil would have made a better conservator, 3331. —Messrs. Palmer and Company are lessees of part of Mr. Ellison's land, and also part of Mr. Brown's, an adjoining proprietor. An application for licence to erect a quay in front of premises occupied by them at Jarrow was read: " and it is resolved that Messrs. Palmer be requested to furnish a plan of the shore on or before the 20th instant, when the Commissioners will view it." That is dated the 8th of April 1852. Then appears this plan, dated April 13 1852. Having no local knowledge of the spot must leave others to explain the plan. The next minute of the Commissioners is dated the 13th of May. "It is resolved to " grant a licence to Messrs. Palmer and Company to " erect a quay of such materials and construction as shall " be approved by the engineer, on the line agreed upon " at the view of 20th April last, the applicants agree- " ing to remove or alter the line as the Commissioners " may require, and that the owner of Springwell Colliery " be allowed to erect and use a third spout on the " usual terms; Mr. Stevenson's amendment to defer " granting the quay having been previously negatived " by a show of hands," 3332.—Then comes a resolution on the 28th October 1852, "That a licence be granted " to Messrs. Palmer and Company to land and convey " ballast behind their quay at Jarrow, on such terms " as shall be arranged by the Finance Committee, sub- " ject to the sanction of the Commissioners," 3333.— The resolution was passed without any division, 3334.

CLAYTON, JOHN—*continued.*

—Mr. Stevenson was present on that occasion. On the 27th of January 1853, " Mr. Brooks reported, that the " bed of the River Tyne and foreshore proposed to be " enclosed under licence by Messrs. Palmer and Com- " pany at Jarrow, will embrace an area of 5 acres, " and nine tenths of an acre," 3335.—That was no deviation from the original plan approved by the Commissioners on view. A discussion afterwards took place on that; then comes a resolution of the Commissioners dated 17th August 1853, " Resolved, that " the clerk give notice to Messrs. Palmer and Com- " pany to suspend their river works at Jarrow " till they have submitted a plan of such works to " the Commissioners, and until such plan shall have " been approved of." Reads a letter of Palmer, Brothers, and Company, explanatory of their position, dated the 7th of September 1853. The resolution of the 22d September is this, " That the engineer do " inquire whether any deposit has been made by " Mr. Palmer since their proceedings were suspended " by order of the Commissioners." On the 8th of December it was " Resolved, that Messrs. Palmer " having raised the river wall at Jarrow to within a " few inches of high-water mark without permission of " the River Commissioners, the same be ordered to be " lowered to the level originally proposed by the " Commissioners." On the 19th of December, it being found that this had not been done, the Messrs. Palmer, who were present, said they did not make the said wall, and that the works were executed by the River Commissioners. Messrs. Palmer admitted driving the piles east of the new staith, and in front of the chalk wall, under the impression that the Commissioners gave them permission to do so when they viewed the work in May 1852. Mr. Brooks stated that the general raising of the wall above what it was in May 1522 had been caused in altering and setting back the line of frontage, as ordered by the Commissioners. Mr. Palmer denied having put down the 15 tons of chalk, as reported by Mr. Brooks, and Mr. Brooks stated that the same was not deposited by any of the workmen of the Commissioners under his direction. This is all witness finds upon Messrs. Palmer's works. The Commissioners have granted no licences to enclose portions of the foreshore. Therefore parties who have done so have acted merely upon the Commissioners' resolutions. All they say is, " As conservators of the Tyne we think it may be safely done." As their legal adviser, should have much hesitation in recommending the grant of a licence, lest the Commissioners should take upon themselves a responsibility which does not belong to them, 3336.— They do not licence it because they can claim no title to the soil, as the title of the Corporation is expressly reserved to them in the Act which constituted the Commission, 3337.—The Tyne Improvement Commissioners take nothing but what they take by this Act, and by this Act the soil is expressly reserved to the corporation, 3338.—It is clause 61. Reads clause, 3339.—Therefore if the corporation had any property in the soil they have it still, 3340.—They claimed it as grantees of the soil, 3341.—The corporation decidedly have claimed, and still do claim, to be owners of the fundus or soil of the river, not merely as conservators, but as grantees from the Crown, 3343.—They make exceptions in favour of those parties who have prior grants from the Crown, 3344.—For the last 200 years the corporation have not exercised the right, except for the protection of the landholders against other claimants. In former days it was otherwise, 3345.— The corporation have protected the landholders by their title against the claim of the Crown, 3347.—The corporation are owners of very large property on the foreshore, 3348.—Smith's Quay down in Shields Harbour is not theirs, 3349.—Willington and Walker are their estates, 3350, 3351.—They have other estates up the river, 3352.—Bill Point belongs to the corporation. The estate below Bill Point is part of the Walker estate, 3353.—It always was a valuable estate, 3354.— It contains 1,000 acres; the foreshore is of trifling extent, 3355.—The shores of the Walker estate are chiefly let to tenants upon leases, who have built quays. They had very good water frontages till the conservators made their river walls in front of them, which gave rise to heavy claims of damages upon the corporation, as conservators, by their own lessees. It would have been more profitable to both parties never to have seen those changes of shore upon their estate which now must take place, 3356.—Merely wished to clear the corporation from the charge of having used

CLAYTON, JOHN—*continued.*

their powers as conservators to benefit their own property, 3357.—It is not the fact that thousands of river funds have been expended in making land for the benefit of the corporation, 3358.—Does not suppose many thousands of river funds have been spent at Willington. Thinks there is some benefit there. At Walker thinks the evil exceeds the good which the corporation have obtained there. The corporation and their lessees had a good river frontage there, and plenty of land behind it. It is not the land alone which gives the value, it is the river frontage; therefore what was before agricultural land had all the advantage of the river frontage. It is not to their advantage to buy land at the cost of the new river frontage, because to build a proper quay there will cost 5*l.* a foot running, 3359.—The quays at Walker were built before by the lessees. With regard to Willington, the corporation had devoted that estate to the reception of ballast, and the ballast hill approached so near the shore that no doubt there will be some benefit to them from the ground taken from the river by the river works, 3360.—This is no doubt valuable land when made into solid land; it is made valuable by its river frontage, 3361.—At Walker the tenants have sustained injury from the river works, for which the corporation have had to pay a good deal of money, and witness fears will have more to pay, 3362.—Bill Point is upon the Walker estate, which is a very large estate, 3364, 3365.—Mr. Brooks can probably give its extent in river frontage. It is altogether nearly two miles, putting Willington and Walker together, 3366.—At Bill Point there was a considerable expense incurred by the late corporation in removing a point of land, in order to improve the sight of the ships going down the river, 3367.—It was done out of the general funds of the corporation; there was no separation at that day, 3368.—It was before 1850, 3369.—Does not think that taking off Bill Point would have increased the shoaling on the Walker estate. The corporation would gladly have allowed the Commissioners to do as they pleased with it, without any compensation to them, 3370.—It has not been taken off, because it is exceedingly expensive, working rock under water, 3371.—Does not say the river funds could not well bear the cost of it. They did not think it expedient to expend the money then for that purpose, 3372.—Mr. Brooks has since placed jetties, which extend the point further westward, and make it less important to have it removed, 3373.—The result of Mr. Brooks' engineering has not been to extend Bill Point further up; it alters the channel, 3374.—Thinks the removal not so necessary as it was before, 3375.—As regards the question of licences, if a formal licence were required from the Commissioners, should do it with care, should submit it to the consideration of counsel, 3376.—By the 46th of George III. one month's notice of all encroachments is required by the Admiralty, after which they are upon the same footing as the rest of Her Majesty's subjects; they may indict or not, as they please, 3377–3380.—The corporation, the old conservators, had an interest in the soil, and perhaps it was more proper that they should grant the licence; but still their licences were very carefully framed, 3381.—Will send for one of these licences, both in the old form and the altered one, 3382–3386.—The conservators have often referred to these licences; they have always had them when they needed them, 3387.—Does not remember that any question has yet arisen as to the licences granted by the old conservators with the new. Has frequently had to refer to the old licences for the new conservators; they have always had access to everything in the possession of the corporation, 3388.—Has not one of the ballast licences granted by the old conservators here, 3389, 3390.—The ballast license by the old corporation allows their lessees to deposit ballast upon the corporation land, or upon any land, as upon the Walker Estate and upon Willington, 3391.—At South Shields, where there is an immense shipment of coals from the Durham Coal Field, they granted a licence to Mr. Salmon, and to those from whom Messrs. Swinburn and Co. derive their title. They made the best bargain they could with those parties, they providing the land, 3392.—The present conservators have not granted any ballast licence, except that to Messrs. Palmer, which is not in writing, and merely stands in the order book of the Commissioners, 3393–3395.—Messrs. Salmon and Swinburn receive, one 10*d.* and the other 11¼*d.* a ton, from the present conservators, out of a due of 16*d.*, 3396, 3397.—The corporation used to pay them that

CLAYTON, JOHN—*continued.*

in olden time under existing contracts, which are saved by the Act of 1850, 3398.—The ballast licence of Messrs. Swinburn is as far back as 1760; Mr. Salmon's is within the last twenty years, 3399.—Supposes they have made a reasonable profit by them, 3400–3402.—Cannot tell what Messrs. Palmer were to receive, 3403.—Said the corporation were paid 8*d.*, only from having looked at the published accounts, 3404.—Cannot tell anything about the fifteen tons of chalk which were deposited by accident; this matter is not within the duty of the legal adviser, 3405, 3406.—The office of clerk is a legal office under the Act of Parliament, 3407.—The accountant acts as secretary to committees, and attends committees, 3408.—Does not know of any arrangements referred to by Messrs. Palmer's letter of the 7th of September. Thinks it very probable that, before the design of Hay Hole Docks was conceived, Mr. Brooks' plan to avoid the loss which would be sustained by adopting Rennie's line, was to advance the southern shore; and has no doubt he would hold out to the parties on the southern shore that they would have the advantage of greater space, and that if they would let him shallow their water, it would ultimately become land; but is not cognizant of any distinct arrangement between them and the conservators, 3409.—At that time the deep water was chiefly on the north shore, but the works at Willington were likely to throw it over to the opposite shore. Mr. Brooks, finding that it would shallow these places at Hay Hole, where upwards of a million tons of coal are shipped, still pursuing Mr. Rennie's principle, alters his lines, but before the alteration is carried out, comes the project of Hay Hole Docks, which restores Mr. Rennie's line. This was in 1849; Hay Hole Dock was not projected till 1850, 3410, 3411.—Would rather not have anything to do with engineering, 3412.—At that time the tide swept into Hay Hole, and they had deep water there, 3413.—Was not present at the meeting when Messrs. Palmer's letter of the 7th September was called for, 3414.—When, in justification of their application for twenty acres instead of five, they referred to an arrangement prior to the Conservancy Board. Knew that there was no arrangement by which the conservators were at all bound, though they would naturally expect to get the increased space produced by changing the channel, if it were carried out, 3415–3417.—Whether the sending the deep water over to the water frontage of Messrs. Palmer, would be an improvement, depends upon whether it was deep enough before; but cannot answer engineering questions, 3418.—It is obvious that a deep-water frontage on the Tyne is more valuable than a shallow one, 3419.—This plan was prepared by Mr. Bell, of Higham Place, Newcastle, as agent of Messrs. Palmer, 3420, 3421.—Mr. Brooks must answer who the plan came from; it was prepared by Messrs. Palmer, and will therefore belong to them, 3422, 3423.—Does not know whether there is any plan, among the records of the conservators, of this land, which Messrs. Palmer, or Messrs. Ellison, or Messrs. Leslie are entitled to take, 3424, 3425.—Has no record of the licence of Messrs. Palmer of the 20th October 1852 being resisted by Captain Purdo and Mr. Stevenson, 3426.—At the meetings of the Commissioners a resolution is sometimes disposed of by a show of hands, but in all important matters the names are taken down, 3427.—Messrs. Purdo, Stevenson, and others might have objected to the ballast licence of Messrs. Palmer, and no record appear of it on the minutes, if they moved no amendment, 3428.—Does not attend views, and cannot tell what passes at them, 3429.—On the 13th of May the application related to making a jetty upon the line agreed to at the view of the 20th April, 3430.—Does not attend views, and cannot give evidence as to what passes at them, 3431.—On 27th January, Mr. Brooks, upon referring to that plan, reports that it is 5$\frac{9}{10}$ acres, confined to land in front of Mr. Brown's land, 3432.—In the letter of the majority to Sir James Graham of the 20th July, there were for the motion, the chairman, Mr. Potts, Mr. Dodds, Mr. Carr, Mr. Ormston, Mr. Ridley, Mr. Rayne, and Mr. Armstrong; against it, Mr. Straker, Mr. Poppelwell, Mr. Stevenson, and Mr. Purdo, 3434.—Does not know whether there was a half-tide wall standing when Mr. Leslie came; does not know when he came. Mr. Brooks can say, 3435, 3436.—Did not make any comment on Mr. Straker having voted in the majority on the resolution of the 23d of March; merely read the proceedings, 3440, 3441.—Mr. Straker has reminded witness that at a previous meeting

CLAYTON, JOHN—*continued.*

Mr. Brooks had been directed to devote his attention exclusively to the preparation of plans for the piers, 3442.—Understood that the Commissioners had determined to erect on the south shore, for two miles up, a half-tide wall upon the plan of Mr. Rennie and Mr. Rendel, and to leave the future heightening or not to the results of experience; the proprietors of the lands had allowed them to do it, 3443.—Captain Purdo's motion of the 8th December 1853 for a return of encroachments was passed unanimously, 3444.—On the 23d March it was disposed of by a motion of Messrs. Carr and Rayne, that it was useless and ought not to be granted, by votes of ten against two, 3445.—Mr. Rayne is a gentleman concerned in shipping, one of the representatives of Newcastle in this Commission; he is a nautical man; believes he is an elder brother in the Trinity House. He resides at Newcastle, 3446–3448.—Mr. Carr resides in the neighbourhood of Newcastle; he is a coal owner on the Tyne, shipping his coals in the bay at Hay Hole, near North Shields, 3449.—The Piers Committee, which had the charge of the plans for piers, with which Messrs. Robinson and Clay waited upon the Lords of the Admiralty in January 1855, comprises eleven out of eighteen members of the Commission, who were unanimous in their adoption, 3450, 3451.—Messrs. Clay and Robinson were charged with the working drawings and specifications by the Piers Committee. On reference to the minutes these drawings have not been before the Commissioners. The Piers Committee had full power to act, 3452.—Remembers the resolution of the 4th of May. Cannot tell exactly the date when it was communicated to Mr. Walker, but put a copy of it into his hands in London a short time after, 3454–3456.—Understood Captain Linskill's objection to be that there was no record of the communication of the resolutions to Mr. Walker by letter, 3457.—No doubt the Captain, in referring to the resolution of the 29th of September, intended it as a reproof to witness for not being as prompt as he thought he might have been. Can only say he did all he could to get the resolution of the 4th of May carried out, 3458, 3459.—The deputation with reference to the harbour for refuge was attended by Mr. Cowen, the chairman, Mr. Mather, and two or three other gentlemen; Mr. Robinson and witness were also present, 3460–3462.—Mr. Cowen and Mr. Mather both acquitted themselves very creditably as representing the Commission, 3463.—Mr. Cowen very justly spoke of the enormous value of the Tyne, and the quantities of shipping coming into it, 3464.—He knew that all who were interested in the trade of the Tyne were interested in the shipping in Shields harbour, 3465.—Remembers Mr. Cardwell speaking of "reports laid before Parliament of a sum of money raised in the Tyne for improving the navigation, being used for a totally different purpose." That, of course, alludes to the alleged misappropriation by the Corporation, the former Conservators, 3466.—Remembers also Sir James Graham saying that the receipts from the shipping in the Tyne were very great, and not all applied to the Tyne navigation purposes, evidently referring to the same period of time and the same state of things to which Mr. Cardwell referred, 3468.—The Corporation took their funds by grant from the Crown for the support of the town and harbour; but the Act of 1850 has prescribed what part shall go to the town, and which to the harbour, 3469.—The Corporation do not enjoy any of the dues upon shipping coming into the Tyne; all they have retained is five-eighths of an export due of 2*d.* a Newcastle chaldron (2½ tons), payable on coal exported from the Tyne, which is a tax upon coal owners. They gave up to the Commission all their dues upon shipping, 3470.—It is an export duty on coal paid by the coal owners; because being in competition with other ports where such a duty does not exist, he must use his coals much cheaper, 3471.—This is a disadvantage which the coal owner shipping in the Tyne experiences; but it is not appreciable, the tax is so small, 3472.—It produces 12,000*l.*, 13,000*l.*, or 14,000*l.* a year, of which the Commissioners have three-eighths, 3473, 3474.—Has no doubt the amount would be sufficient to keep the river in a very good state in a few years, 3475.—Mr. Rendel recommended a half-tide dock in the Hay Hole Dock; the coal owners said it would be a great mud trap, that they would not be able to ship their coal in it, or use it for any purpose, 3476.—In consequence of which they will ultimately have a full-tide dock, and they will pay for it, 3477. A full-tide dock is much better for the coal-owners and the trade of the port, 3478.—The result of

CLAYTON, JOHN—*continued.*

this difference of opinion from Mr. Rendel is, that they have got a full-tide dock instead of a half-tide dock by Act of Parliament, and without costing the river funds one penny, 3479.—A clause was put in to enable the Commissioners to charge their share of the coal tax received in that dock as a collateral security for the money required to carry out the works. It was resisted by the Shields party, and the clause was abandoned, 3480–3482.—When the ballast due which the Corporation were to receive was settled at 8*d.*, does not remember Mr. Poppelwell stating that the Corporation only paid 4*d.* themselves in some cases. Does not think they could deposit ballast at 4*d.* a ton, 3483, 3484.—Has not ascertained the profit per year; Mr. Stevenson stated it to be 800*l.*, 3485.—Does not think a case would have been stated on behalf of the ship owners which could have led to a different opinion; it was a very simple question, 3487.—In the Bill of 1850 cannot tell the precise period when that clause was introduced which exempted the Corporation from liability, 3488.—The advertisement offering the water frontage upon Mr. Ellison's property was put in by his land agent to let his land, occasioned by the establishment of many iron ship building works on this river, 3489.—He had a great extent of shore, much of it deep water. Mr. Ellison has a large estate there, 3490, 3491.—Did not observe the date of the advertisement, 3492.—If there had been many parties to deal with, or but one unreasonable person, it would have been necessary to obtain compulsory powers to deal with the land owners. The Corporation would have been placed under the Lands Clauses Consolidation Act, and must have paid the damage their works might occasion to every gentleman's property, before they commenced those works or took possession of any part of the soil, 3493.—Cannot tell whether the documents handed in yesterday were the whole of Mr. Rendel's appendix. Received the papers from Mr. Rendel, and handed them to Mr. Brooks, the engineer, 3494, 3495.—Witness did not think it necessary to take any account of the papers Mr. Rendel gave him, as they related entirely to engineering, 3496.—Cannot exactly say when he received the papers from Mr. Rendel. The Corporation had a heavy sum to pay Mr. Rendel, and until the balance was paid off they did not press for the papers, 3497.—It is an engineering matter, and is in the hands of Mr. Brooks, and perhaps the secretary to the Committee, 3498, 3499.—Believes the Commissioners have been supplied with a copy of Mr. Rendel's report, 3500.—There is an Act of George the Second which provides that all ballast shall be cast upon land where the tide never flows, but the local Act relieves the Corporation from that provision, 3501.—Has had occasion to refer to that Act at different times when advising the Corporation upon these questions. It has also been referred to in objection to the schemes for carrying ballast out to sea, 3502, 3503.—The Life Commissioners were a sort of compromise in lieu of the Admiralty clause with the opposers of the Bill, 3504, 3505.—One of those Life Commissioners is Mr. Cowen, who acts as chairman; he resides about four or five miles out of Newcastle, up the river, and has an establishment very near the mouth, 3506, 3507.—In this arrangement witness thinks Mr. Cowen was recommended by the promoters of the Bill, as a Newcastle representative, 3508, 3509.—Another life member is Mr. Hunter, an influential director of the York, Newcastle, and Berwick Railway, also a Newcastle representative, 3510–3512.—Another life member is Captain Purdo; supposes he was named by North Shields as a North Shields man, but does not know, Captain Linskill will know, 3513, 3514.—The other life member was Mr. Stevenson, recommended as a South Shields representative, 3515.—Mr. Stevenson, Mr. Poppelwell, and Mr. Straker are active members of the Commission, 3516.—Witness does not think Mr. Hunter was a director of the railway at the time he was named a life member, 3517.—Captain Purdo has a theory which he supports very perseveringly, 3518.—Thinks that Captain Purdo and Mr. Stevenson would have divided had they objected to the permission given to Mr. Palmer to fill up ballast, 3519.—In the arrangement with Messrs. Palmer and Mr. Brown has no doubt Mr. Brown contemplated getting space of land, as a compensation for and in lieu of the benefit which he lost of the berthage which then existed, 3520.—This is stated in Messrs. Palmer's letter, but witness stated before that he was not cognizant of any specific agreement to that effect, 3521.—Cannot tell to what extent the quays run along the corporation frontage at Walker, 3522,—Neither

CLAYTON, JOHN—*continued.*

the Commissioners nor others have any allowance for their expenses in coming to Newcastle, 3523–3525.—The meetings are held occasionally at Shields. The committees of the Commission meet at Shields very often, and much business is done by the Committees, 3526.—Believes that the objection of the landholders to the alteration of the foreshore has been a bonâ fide objection. The late conservators never attempted anything but a full-tide quay, and they induced the landowner to advance his shore to the new river line wherever they could, 3527.—The conservators uniformly got the landholder to build the quay. The river is a hive of industry, and the manufacturer being established upon it with his water frontage, even if the shore were made deeper opposite his property, it was no compensation to him for the disturbance and expense of a new frontage, therefore it is difficult to get persons to adopt a new line, 3528.—In some cases can conceive it to be worth the expense of altering the river frontage from shoal water to deep water, but that depends upon the sort of craft in the habit of resorting to that part of the shore, and the business carried on there, 3529.—The Commissioners receive a ballast due of 16*d.* per ton for receiving and depositing ballast, and they pay as little as they can for getting the duty performed in different parts of the river. Some parties who receive ballast have expended a large capital on their establishments. Mr Salmon, one of the ballast lessees under the late conservators at South Shields, has expended above 10,000*l.* upon the faith of a lease granted, with liberty to deliver ballast for a certain number of years, he taking it away and finding a depôt, and receiving from the Commissioners a specified payment for so doing, 3530.—It does not matter to the shipowner who takes the ballast, or where it goes; they pay 16*d.* per ton to the Commissioners, and they get it delivered by their lessees. It is desirable, for expedition and safety, that it should be delivered without the intervention of river craft; therefore if the ship master can go up to the ballast machine it is better for all parties, 3531, 3532.—If other parties can by convenient means carry away the ballast at only 6*d.* per ton, it will be an advantage to the shipowners generally, but then the Commissioners will not get their dues, 3533.—The proposal of Messrs. Stevenson showed that ballast could be taken out in hoppers and delivered at sea at 11*d.* per ton, 3534.—A great part of the revenue of the Commissioners for the purposes of the Tyne, is derived from the ballast. A great profit accrues to them from the delivery of ballast, 3535.—The reveuue of the Commissioners will be much decreased if water ballast be substituted; the shipowner will relieve himself of his ballast without payment to any one, 3536.—Witness cannot say whether the shipowners would be able to depend on a constant and cheap means of removing ballast if the question were thrown open to public competition, 3537.—The interest for the money raised for the construction of Hay Hole Docks was to be paid out of capital, till the docks are open for traffic, 3538. There is a clause in the Act of Parliament which overrides Lord Campbell's decision "that payment of interest out of capital is illegal," inasmuch as the Legislature is omnipotent, 3539.—There is at present one dredger in the river worked by steam, 3540, 3541.—Witness thinks the employment of two dredgers would be too great a demand upon the funds of the Commissioners. They are building a second upon a larger scale, but hopes that the improvement in the channel of the river may be so great that they will not need to employ the two, 3542.—Two dredgers would, of course, do more good than one, and would give more satisfaction; it is at present a question of expense, 3543, 3544.—The result of the resolution proposed by Captain Purdo, that a return should be given of the alteration made in the state of the river by half-tide walls, was that such a return would be of no use, and ought not to be furnished. By a majority of 10 to 2, 3545–3549.—In referring to the letter of the Secretary of the Admiralty, extracts from which have just been read, concerning the former agreement with Mr. Walker to superintend the works. It will be seen by the context of the former agreement that it is confined to fixing the plan of the works. The Commissioners have arranged with Mr. Walker that he shall be their consulting engineer. The Admiralty seem to wish for something more, and probably a satisfactory arrangement may be made between the Commissioners and the Admiralty in a short time, 3550.—The agreement, as stated in Mr. Walker's report, does not extend to the particulars stated in the letter from the Secretary of the Admiralty, 3551.—The Admiralty statement is incorrect according to the Commissioners' construction of the agreement, 3552.—There is some difficulty in the appointment of an engineer, 3553, 3554.—The Commissioners receive 16*d.* a ton for taking out and carrying away ballast, and pay Messrs. Salmon and Swinburn and Co., one 11½*d.* and the other 10*d.* per ton for doing the duty for them; the difference is the profit of the Commissioners, and is part of their revenue. It goes to the general fund, 3555, 3556.—The whole sum received by the Commissioners in respect of the river all goes to the purposes of the river, 3557–3560.—Sir James Graham's and Mr. Cardwell's opinion as to the state and management of the funds, was formed upon the evidence of the state of things previous to the Act of 1850, 3561.—If the present state of the financial question were put before them, their view would be differently expressed. They say they have only assisted places where the trade is small; but they see that the trade here is enormous, and a slight tax upon that will produce a large sum. They think that a special tax should be levied on the banks of the Tyne, for the purpose of erecting piers, and not have it done out of the public taxes, 3562, 3563.—They look to a small tax upon shipping for raising this fund. The number of ships is so enormous, foreign and British, frequenting this port, that a small tax raises a large sum, 3564.—Meaning an additional tax, because the Commissioners' means are not adequate to a large expenditure; and they hope, by adopting the notion of the Admiralty, that on the south side of the harbour it is unnecessary to make more than a rough breakwater, the expense will be brought within their means, 3565, 3566.—Witness reads the total revenue of the corporation of Newcastle from a printed account. The five-eighths of the coal duty produces them 8,700*l.* in round numbers. The rents of their estates 8,400*l.*, the rents of markets about 3,000*l.*, their tolls 3,540*l.*; but these are more than absorbed by the duty attached to those tolls; they must be considered as producing less than nothing, because more than the whole is expended. The rest of their income is made up of rates upon the town, 3567.—The total receipts from 1852 to 1853, which witness has before him, including every sort of income, are 37,984*l.* A great deal of it goes in indispensable disbursements; they have to sustain all the expenses of a county. Newcastle is a county of itself, 3568, 3569.—The corporation could not undertake any large works, as their revenue is already exhausted by necessary payments, 3570.—Witness has no doubt that a great national work, such as piers at the mouth of the river, would become a benefit to the country at large, 3571.—Does not think there is a place between the Humber and the Firth of Forth where a harbour of refuge could be more advantageously constructed than at the mouth of the Tyne, 3572.—Such a harbour would be to the benefit of the whole district in the first instance; in the second to the country at large, and most important to foreigners passing along the coast, 3573–3576.—In case of war with any of the north-eastern powers it would be very important in defence of the country, as there is no other place for ships of war to resort to between the Forth and the Humber, 3577.—A large proportion of the trade of Great Britain is carried on along the coast of Durham and Northumberland, 3578.—In case of a war with Russia or France, that trade would require protection for a great extent of coast; and there is no port between the Forth and Humber in which ships intended to protect the trade can lie, or to which they can run in case of bad weather, 3579, 3580.—Witness thinks there is a strong claim upon national assistance in the execution of piers at the mouth of this harbour, 3581.—Thinks there is a decided correspondence between the views of the engineer employed for many years by the corporation and the eminent engineers consulted on the subject of the improvement of the Tyne since the beginning of this century, 3582.—All parties attach great weight to Mr. Rennie's opinion, 3583.—Witness believes, from the extract read from Mr. Rennie's report, that the engineer employed for many years past by the corporation has endeavoured to carry out the views advocated by Mr. Rennie in 1813, 3584.—Witness has stated that the income of the corporation arises from rates on the inhabitants of Newcastle, nearly the whole of which is expended on public local purposes in the town, and if called upon to contribute any sum to any additional works, would have to replace

CLAYTON, JOHN—*continued.*

that by additional rates upon the inhabitants, 3585–3587.—Witness will let the chairman have the three letters of the 22d April, 11th of May, and the 18th of May, relating to piers; has put in such as seemed material, as he wished to embarrass the Commissioners as little as possible with unnecessary matter, 3588.

CLYDE:

Knew that river when there was 6 or 7 feet water, *Straker*, 197.—The works began at Glasgow downwards, *Brook*, 2437.—States the practice pursued in the improvement of the Clyde, *Ure*, 2884.—The great object in the Clyde has been to make deep water up to Glasgow, *ib.* 2898.—The sum expended on the Clyde was about two and a quarter millions; that was for about 80 or 90 years, *ib.* 2900.—Mr. Rennie refers to the Clyde as an example in favour of the plan he lays down in his report on the Tyne, *ib.* 2912.—All land acquired from the river was taken possession of by the landholders; the Clyde trustees have had to buy a good deal back, *ib.* 2914–2916.—Dredging, such as practised in the Tyne, would not be under a shilling a yard, *ib.* 2917.—Is a river below Glasgow; the estuary begins about Dumbarton, or Port Glasgow, *ib.* 2919.—The rise of tide at the mouth in ordinary spring tides is from 9 to 10 feet, *ib.* 2924.—The constitution for the government of the Clyde is elected from the Town Council, the Chamber of Commerce, and from the Trades' House; the magistrates of Glasgow are all Trustee ex-officio. First, each ward elects three to the Council, and those return one to the Trust. It is a representative body; it consists of 32 or 33, *ib.* 3089–3091.—In the Clyde the works are carried on under Parliamentary powers, *ib.* 3135.—Within the last thirty years there have been three complete general surveys of this river made, *ib.* 3137.—Is not a parallel case to the Tyne; points out the differences, *Rendel*, 4002–4004.—Everything goes by steam, *ib.* 4007.—Has been made what it is entirely by the dykes, and getting rid of shoals by dredging, *Walker*, 4462.

COAL:

Half the coal shipped upon the Tyne is shipped at South Shields, *Brooks*, 2426.—The tax upon coals is very small, *Clayton*, 3472.

COAL DUES. *See* DUES.

COAL OWNERS:

The full-tide dock is much better for coal owners than a half-tide dock; in the Hayhole Dock it would be a great mud trap, and of no use for any purpose, *Clayton*, 3476, 3477.

COAL TRADE:

Of the port is increasing very considerably, *Straker*. 142.

COBBLE DEAN:

Lies between White Hill Point and Smith's Quay, *Brooks*, 2336.—When the Cobble Dean Dock was sanctioned, the corporation of Newcastle required that the dock should come out of Mr. Rennie's line, *ib.* 2337.—Approves in principle of enclosing Cobble Dean, *ib.* 2340.—Advocates shutting it up as an inlet, which interferes with the direct course of the river, *Taylor*, 2816.—Inlet. Proposes to enclose it entirely with full-tide walls, *ib.* 2759.—And Wellington Gut, proposes to enclose them to the extent of 2,450,000 cubic yards, *ib.* 2763.

COCKCROW SAND:

Is between the lower part of Hebburn and Wallsend. Notwithstanding the jetties, a large portion of it still remains, *Poppelwell*, 712–715.—A great part gone away in the last fresh, *Danson*, 1529. *See* SAND.—If solid land is made opposite to it, it will not be valuable for water frontage, but for manufacturing purposes, *Brooks*, 2160–2161.

COMMISSION:

Existing. Does not think it has worked efficiently, *Lamb*, 385.—The constitution of the Commission arranged by a Committee of the House of Commons, *Linskill*, 1021.—Has worked efficiently, *Clayton*, 3331.—The Shields Commissioners do not wish to do anything until they have a majority in the Commission, or have got rid of

COMMISSION—*continued.*

Mr. Brooks, *Allhusen*, 3735.—There are to be two Admiralty Commissioners appointed by the Admiralty, *Mather*, 3776–3778.—Thinks it has worked well generally. The working of it is daily improving, *Robinson*, 3813.—Thinks on the whole it has worked efficiently, *Philipson*, 3871.

COMMISSION, NEW:

Instead of being an independent body, it is still mixed up with the old conservators. It has not worked efficiently, *Stevenson*, 1291–1296.

COMMISSIONERS:

The nature of the power of the Commissioners for preventing nuisances is explained in the Act of Parliament, *Cowen*, 3676.—Every one of the Commissioners has the power of referring to the minute book of their proceedings, and if he is present at a Commissioners' meetings he hears them read over, *ib.* 3708.

COMMITTEES:

Proceedings of the Tyne Commissioners conducted by committees, *Linskill*, 950–953, 1022–1025.—The Committees on the Tyne Improvement Board are very numerous, *Cowen*, 3703.—Always endeavours to appoint parties on the Committees who best understand the work, *ib.* 3719.—On the 17th August a Committee was appointed to prepare for the meeting of the Royal Commissioners, *Clayton*, 3325.

COMMITTEE, RIVER LINES:

There were two; the first in 1852. Mr. Robinson's recommended the half-tide walls; they could not work, and Mr. Allhusen's Committee was appointed last year, *Stevenson*, 1129–1132.

COMPENSATION:

The Reformed Corporation happened to have considerable property of their own, and they commenced operations in front of that property; a good deal of it let on leases, and they have had very serious claims for compensation on the part of their lessees, and also on the part of other persons, to deal with, *Clayton*, 3298.

COMRIE, Mr. ALEXANDER: (*Analysis of his Evidence.*)—Is the son of the late Mr. Alexander Comrie, a marine surveyor, 1881.—States his father assisted Mr. Giles in making the survey of 1813, for Mr. Rennie, 1882.—His father was employed by Mr. Rendel in the year 1849, to re-survey the river between the bar and Newcastle Bridge, 1883.—He then prepared a plan showing the same soundings taken in the same parts as in 1813, 1884.—States his father, in the course of last year (from September to the end of the year) was employed by the Tyne Commissioners to go through the soundings which had been taken in 1813 and 1849, he was also instructed to take new soundings on the same lines, 1885–1887.—Witness was with his father when he took the whole of the soundings, and assisted him in doing so, 1888, 1889.—Was with him during the taking of the last soundings, and also in 1849, 1890.—The autumn of last year was one of the dryest seasons that has been known for many years, 1891.—On the map, the soundings of 1854 are marked in red ink, and of 1849 in black, 1892, 1893.—Sounded the bar the last week in September 1854, the weather was then dry, 1894.—The soundings were continued in the close of last year up to December, 1895.—The survey which commenced in March 1849 was under the direction of Mr. Rendel, 1898–1900.—The soundings witness took then under the direction of Mr. Rendel—1901.—States it was not part of Mr. Rendel's first instructions to his father that he should repeat every sounding which was taken by Mr. Rennie in 1813, or that appeared upon his chart; he gave a second set of instructions, desiring his father to take every section, which was done, 1902.—His father did repeat, under the instructions of Mr. Rendel, every sounding that appeared upon Mr. Rennie's chart of 1813, with the exception of those between Prior's Stone and the bar, 1903.—The soundings so taken were not laid down upon Mr. Rennie's chart, they are laid down here; the soundings in 1849 are in black, those of the autumn of last year in red, 1904.—This was the identical chart furnished by Mr. Rendel to the conservators, and upon this chart witness has laid down the soundings that were since taken in this last

COMRIE, Mr. ALEXANDER—*continued.*

autumn, 1905, 1906.—The instructions which his father received from the conservators as to these soundings were, that he should repeat the whole of the soundings which were taken in 1849 in the same lines, 1907.—His father received a letter from Mr. Clayton, desiring him to come to Newcastle as soon as possible. Cannot say whether he received the instructions about the soundings by letter, 1908.—Can get the first letter his father received from Mr. Clayton; has not it with him; thinks it was subsequent to the 14th of September, 1909–1911.—The instructions upon which his father proceeded were those given by Mr. Clayton when he arrived in Newcastle, 1915..—Cannot say whether the instructions were given verbally or in writing, 1916.—Thinks his father was then acting under Mr. Clayton's instructions; he was acting more in conjunction with Mr. Brooks, but cannot exactly say; they were both under the Commissioners, 1918, 1919.—In 1849 believes there was a very elaborate series of tide observations; they were mostly carried on under his father's direction, 1920–1923.—Witness was himself more as an amateur in 1849. Cannot speak with regard to tidal matters, 1924.—There were some tidal observations made this last autumn; thinks Mr. Brooks made them, 1926, 1927.—The survey of 1849, was a survey continued from March to September, 1932.—The survey of last year was a survey beginning in autumn and terminated in December, but the survey in December was not a land survey, but merely a repetition of the soundings. The survey in 1849 was both a land and a marine survey. By a land survey means the outline of the shore, 1933.—Some soundings were taken previous to the making of the plan and some afterwards, 1935.—The great bulk of them was taken afterwards, 1936.—The greater part of the soundings were taken in August and September, 1937.—And those of last year would be taken in September and October; in fact the whole time from September to December, 1938.—The tides which were going on during September, when witness made his last observations, would be what are called equinoctial tides, 1939.—The soundings on the bar were taken on the 13th and 14th September, the principal part of them; some were taken on the 15th of September, that was just about a week before the equinoctical spring tides, 1940.—That was before the equinox; it was very still weather, 1943.—A man named Blackett, of Shields, was the actual person who took them. Witness and his father were both present, and nobody else, 1944–1946.—Those over the bar were taken by sextant angles, 1947.—Tried the force of the current in Shields harbour; found the result to be on the ebb-tide about three and a half knots per hour at about first quarter ebb, 1948–1951.—Measured it by the points on the shore and on the plan. Saw the distance on the plan, and calculated it; passing different points, for instance, the New Quay point, and so on, 1952.—Took also the time occupied in passing different points, 1953.—In a boat, had a float besides, 1954.—With respect to these observations on the velocity of the tide in Shields harbour, did not try further up the river so as to get the average velocity, it was down the river in the stream, 1955, 1956.—The soundings over the bar were referred to the same datum, therefore, whether it was a spring tide or neap tide, or equinoctical, or not, it would make no difference; they were all referred to Mr. Rennie's datum, a mark on the Low Lighthouse, 1957, 1958.—Therefore, the depths of water which witness gives are, in fact, the vertical measurements from the level of some mark (believes Mr. Rennie's datum) down to the ground of the bar, 1959.—And not affected in the least by the question of whether taken at high water or low water, or whether it was spring tide or neap tide, 1960, 1961.—These soundings were taken with a lead line on the bar by the best man they could possibly get at Shields, an old man-of-war's man, a regular man for taking soundings, 1962, 1963.—States his father and himself were with him. His father looked at him when he took them, and witness put them down in the book, 1964.—Ascertained the level of the water at the same moment at the tide-gauge by placing a man at Prior's Stone, with a watch regulated by witness's, and he took the tide every five minutes, measuring it from the top of that rock, from Mr. Rennie's datum, 1968, 1969.—Used a lead line on the bar, a pole in the river, 1971.—The lead line was measured almost every night, 1972.—The depth would be measured from the bottom of the lead, as hanging perpendicularly up to the mark on the lead line, 1974.—The length of the lead was included in the measurement, 1975.—They were taken on the ebb-tide, very nearly low water; in fact, the object was always to get as near low water as possible, 1977.—There was no allowance made for the slope of the surface between the Prior's Stone and the place were the soundings were taken, 1978.—Thinks the channel across the bar is generally of uniform depth, 1979.—Thinks the difference of a ship's length on one side or the other of the deepest water line would not make a difference in the soundings, 1980.

CONSERVANCY OF THE TYNE:

Remarks upon, *Purdo*, 423.—A pure local conservancy, situated as the parties are on this river, cannot work for the good of the public in general, *ib.* 564.—The system on the river has gone on every way the same with the new Commissioners as with the old conservancy, except the not putting so much ballast into the river, *Poppelwell*, 736.—The new conservancy has not worked efficiently, *ib.* 770.—Thinks it very desirable that there should be some controlling power either in the Admiralty or otherwise, *ib.* 771.

CONSERVANCY ACT:

For the improvement and regulation of the Tyne. Extract from *Brooks*, 2454.

CONSERVANCY BILL:

Committee for the promotion of, in 1848 and 1849, consisted of about 40 or 50 gentlemen of North and South Shields, *Linskill*, 909, 910.

CONSERVATORS COMMISSION:

Witness does not think since its establishment in 1850 it has worked efficiently, *Straker*, 137.

CONSERVATORS OF THE TEES:

Recommended the same principle to them as had been carried out on the Tyne, *Brooks*, 2438.

CONTROL, GOVERNMENT:

Thinks there should be the strongest possible Government control, *Linskill*, 992–999.

CORPORATION:

Have commenced to deposit ballast on that site which witness estimates at about 135 acres, and have received the 8*d.* and 9*d.* a ton for what they have deposited, *Poppelwell*, 812–815.—Claim to be owners of the fundus or soil of the river. Not merely as conservators but as grantees from the Crown. They make exceptions in favour of those parties who have prior grants from the Crown, *Clayton*, 3344.

COURT OF APPEAL:

There ought to be a control on behalf of the public interests, which are at stake; had there been some court of appeal to settle those points upon which there have been disputes, the Commissioners would have been very much more efficient, *Stevenson*, 1297–1302.

COWEN, JOSEPH, Esq (*Analysis of his Evidence.*)—Is Chairman of the River Tyne Improvement Commission. Is a coal owner and fire brick manufacturer, 3589, 3590.—Carries on his business some distance above Newcastle Bridge; has also an establishment at Jarrow Quay, 3591, 3592.—Attended the Admiralty inquiry of Messrs. Lawes and Abernethy in 1850. Was also before the Committee of the House of Commons, 3593, 3594.—The Act of 1850 was not only a compromise between Shields and Newcastle, but also with the public generally, and especially the landed proprietors, whom witness at that time had taken some interest in representing. On reference to the blue book, it will be seen that in the inquiry before Messrs. Lawes and Abernethy, witness took great interest in getting a representative part of the body for the parties west of Newcastle Bridge. Afterwards attended before the Committee of the House of Com-

mons in support of a petition signed by Lord Ravensworth, Sir Thomas Clavering, and all the other landed proprietors, with the view that if there was to be a change in the representation of the Tyne, it was right they should be represented as well as the borough of Newcastle and the parties at the mouth of the river. Witness persevered in representing his views upon the subject to the Committee of the House of Commons to the last, and at last was induced to accept the Bill as it now is, as a compromise between the whole parties, 3595.—Having been appointed a Life Commissioner, and being desirous to carry out the views of the Committee, believing them to be very proper and just, the first thing witness did, was to recommend to the Commission to get an Act of Parliament to deal with the whole river, from the bar to Hedwin Streams. After discussing the matter it was agreed, very properly, not to go to Parliament for so sweeping a measure, but for an Act to make the piers, which it was unanimously agreed was the best work to commence with, and next to that the Hay Hole Docks. Witness quite concurred in that, especially with regard to the Hay Hole Docks, because, be it remembered, that without touching upon the funds of the Commissioners, that will become public property, the same as the River Tyne; and if the rapidity of the shipping of coal goes on, it will not be many years before it will become a free dock, with the exception of keeping it in repair. These, therefore, were the two most important measures for which to go to Parliament. Witness thinking that measures in the western part of the river would be productive of great benefit to the eastern, wished to include the improvements west of Newcastle Bridge, but Mr. Phillipson, who was in the Commission, and others, thought it was time enough to consider what was to be done above bridge at some future time, 3596.—The piers and Hay Hole Dock are both in the borough of Tynemouth, 3597.—The reason that nothing has been done with regard to removing Friar's Goose Point, Bill Point, and Whitehill Point, is that the Commission have not had the money. Their legal expenses have been about 18,000*l.*; they have borrowed the money, but have paid a great deal out of capital. Witness thinks it desirable that these three points should be removed, but concurs with Mr. Ure, the engineer of the Clyde, that it would be very unwise to remove Whitehill Point at the present time. The docks at Hay Hole and the docks at Jarrow both pending, and considering the immense amount of property there is at the south or south-west end of South Shields, which would be thrown into entirely shoal water, or sustain immense injury, there would be no corresponding advantage derived from taking off that point, therefore it ought to be deferred, 3598.—Witness fully concurs in the great necessity for making accommodation for the ships near the sea, and in a subsequent part of the proceedings will show the great desire on the part of the Commissioners that that should be the case. But they must take a comprehensive view of this river; they are conservators from Hedwin Streams to the bar. Witness knows he is liable to have it said he lives in the western part of the river. This is true; but the whole of his business has to come down the river, and he is deeply interested in it from its highest to its lowest points; and though, in the first place he would provide ample acccommodation for the people of Shields, sees no reason to despair of having docks of considerable magnitude much higher up the river, if it is possible to do away with Tyne Bridge, or to make a new Tyne Bridge so as to pass ships through it, 3599.—Would be very sorry to give offence to any class of men, but thinks there is a mistaken notion on the part of the shipowners as to their position in this matter of Shields Harbour. At any rate, the coal owners and manufacturers on the River Tyne are equally, if not more, interested than the shipowner. The shipowners are the common carriers for the producers of the Tyne. It may be an offensive term witness does not mean it so, but it is the fact. A shipowner can come into Shields Harbour as long as it answers his purpose; if it pays him better to go to London, Liverpool, Glasgow, Dundee, Edinburgh, or Perth, he does so, and does not come to Newcastle. The same thing does not apply to the manufacturer. There are coal owners who have invested from 20,000*l.* to 300,000*l.* in collieries, and some parties have similar sums in manufactories. Now the plant of these men is fixed; it is local, it cannot be removed. Who, then, are interested in this great navigation? Why these men; because, if the coals can be taken for

6*d.* a ton less freight out of the river, in consequence of putting it in a better state of navigation, these men can send the coals better to market, 3600.—All are interested in deepening the bar, but the people of Newcastle more than the people of Shields. If a vessel goes from Newcastle, especially if she has a great draught of water, she goes away a little before high water, but before she can get to the bar the tide has fallen a good deal. Now that does not apply at all to Shields, because they can go out just at the time of top high water, and they are right out at sea, 3601.—Witness was one of the Commissioners who went to see where the line was to extend upon Messrs. Palmer's property; Mr. Stevenson and Captain Purdo were there also, 3602, 3603.—The course determined on was not objected to by any one, 3604.—The enclosures of Messrs. Palmer and Messrs. Leslie are the only ones which have been authorized by the Commissioners, and were done in accordance with the proposed river lines, 3605, 3606.—With regard to Mr. Leslie's case, Mr. Straker came to the Commissioners' meeting, and urged upon them the propriety of doing what Mr. Leslie wanted. Does not say that that was doing exactly what is now shown upon the plan, but it was doing something Mr. Straker thought right to be done; and all were so desirous to give encouragement to a new man like Mr. Leslie to locate himself upon the banks of the Tyne to build iron ships, that all were unanimous in giving him every facility. Sees on the table a plan subsequent to that, signed by witness, which is what was agreed to, and wishes it to be understood that he has never signed any of those plans without saying to the Commissioners, "This is what you have agreed to be done," 3607.—There has been access at all times to any of the plans in the possession of the Commissioners by any member of the Commission, or the engineer. Thinks if Mr. Stevenson did not open the plans it must have been his own fault; he has had every facility, 3608, 3609.—Captain Purdo has always got a full and fair hearing at the Board, and has often been allowed to make two or three speeches when he should only have made one, 3610.—The River Lines Committee have agreed to river lines from Shields to Newcastle. Is not aware there was any difference of opinion, but it was thought desirable to have plans drawn showing the lines agreed to, and showing, witness thinks, Mr. Brooks' and Mr. Rennie's lines. That matter is completed, and the Commission have only to make a short report with the lines, 3611.—Remembers the meeting of the majority and minority on the 15th of June, on laying the foundation stone of the piers; a very pleasant meeting, 3612, 3613.—At the time of that meeting was not aware of the letter of the 3d of June. Was in London in the months of May and June, endeavouring to get the Admiralty signature to the plans of which Mr. Clayton has given an explanation. There was no disposition on the part of the Admiralty to protract what was being done, but it was just at the time Captain Napier was going to the Baltic, which caused a little delay. Attended at the Admiralty on the 1st or 2d of June, but the document had been sent down to Mr. Clayton the night before. Saw there Captain Washington, who said, "I assure you we wish well to the Tyne," also saw Captain Vetch, who said, "Any plans or information in this office which we can show or hand to you, are at your service." This was on the 2d of June; on the 3d this letter was written. On the 15th the Commission had to lay the foundation stone of the piers, and witness thought he had also laid the foundation stone of long unanimity of feeling amongst the good folks on the Tyne. In a few days this letter came out. The letter which was signed by witness on behalf of the Board was written under feelings of disappointment at the conduct which they had met with from that party, 3614.—With respect to the funds, to show the desire the Commission have to do the best they can for the harbour of Shields, they have a mooring fund, which provides by a separate tax upon shipping for putting down moorings. In round numbers the amount of that fund is about 1,800*l.* or 2,000*l.* a year; it is a farthing a ton upon shipping; one third goes to the police fund, two thirds to the moorings. It is insufficient to meet the expenses of putting the new moorings. In the year before this the Commission lent 872*l.* 12*s.* 5*d.* to that fund. During the present year the Commission have expended 2,057*l.* on that fund, and are now going on with new works of that description, which will incur 4,000*l.*, and will

COWEN, JOSEPH—*continued.*

draw from the general revenue next year 2,000*l.* more. Certainly only 2,000*l.* has been applied to the improvement of the river, but the question of the moorings, though having no claim upon the general revenue of the Tyne, was considered by witness as an excellent appropriation of the general fund, with a view to satisfy, if possible, any claims from parties at the eastern end of the river. With respect to the piers it has been said that comparatively nothing has been done. Now last year the whole of the revenue was expended, about 10,000*l.* or 11,000*l.*; 6,000*l.* was paid to the Dean and Chapter of Durham for 36 acres of land, and the Commission are under contract for about 5,000*l.* for making a railway to begin the piers, 3615.—Witness does not agree that the land is worth 1,000*l.* an acre. In supporting the Jarrow docks believed they would be of great importance to the Tyne, and especially to the people of South Shields. Upon enquiry found that within three or five years of the formation of these docks, half a million of tons of coals more would be shipped in the Tyne than if there was no dock at all, and that with coal dues and pier dues the River Tyne Commissioners would get better than 2,000*l.* a year, irrespective of other things. Being convinced that no harm would result to the river from the closing of Jarrow Slake, as chairman of this Commission felt bound to support these docks. Had this dock not been formed there is great probability that this extra quantity of coals would have gone to Sunderland. With regard to the constitution of the Board, thinks that any attempt to alter it, at the present moment, would be attended with great inconvenience and expense, and has no doubt that every landed proprietor on the banks of the Tyne, from Hedwin Streams to Shields, would oppose any alteration in the Bill unless they got a fair proportion of representatives, 3616.—Is speaking of the Conservancy Bill. One object of the present Commission is to consider the constitution of the Board, and if there is to be a change, is aware that there would be a determination on the part of the landed proprietors to get a fair representation of the whole parties from one end of the river to the other. There can be nothing unreasonable in such men as the Duke of Northumberland and Mr. Ellison, who have such large estates, thinking they have a right to be represented in this Commission. But they are not seeking for change, and it would be a very impolitic measure in this early stage of the Commission, 3617.—Thinks the Commission as a whole has worked as well as any one could expect, and the greatest benefit that can be conferred upon it is to leave it and its officers alone. Captain Linskill talked about the proceedings of the Commission in Committee not being fairly reported; this is libelling the Board. At these Committee meetings resolutions are passed, but there are no long speeches. The Captain can see all these things at any time. If he were to attend more of those meetings than he has done, he would have a more general notion of how the matter was going on. From what has been said about the cargoes of vessels coming into the river should have supposed that only one tenth of the cargoes coming into Shields Harbour was consumed or used by the people of Newcastle; believes the reverse to be the case. About one tenth is used by the two boroughs at the mouth of the Tyne, the remainder comes up to Newcastle, 3618.—Looking at the financial statement of last year, the Commission have exceeded the revenue by 2,000*l.*, but believes when wound up to the 31st of December it will be found to be rather a good year. The dredging the year before was 4,641*l.*; 2,251*l.* for river improvements; 64*l.* for small expenses; moorings are stated at 2,057*l.*; 1,700*l.* for a steam tug in connexion with the dredging; law expenses were 7,120*l.*, 5,000*l.* of that were borrowed, 3619.—The law charges are for the whole expenses of former bills, 3620.—Believes the Commission have now paid off all the legal charges, amounting to about 18,000*l.* Witness wishes to remark that he has no connexion with the corporation of Newcastle, not even a vote for the councillors. His place of business is chiefly five or six miles up the country, 3621.—When it was represented that nine tenths stopped in the boroughs of Tynemouth and South Shields, and one tenth came up here, understood they were speaking of cargoes, 3622,—Decidedly denies that the Commissioners and Newcastle party have opposed the construction of quays at North Shields, 3624.—In the same year that they became conservators quays were awarded to it, 3625.—Knows

COWEN, JOSEPH—*continued.*

that there was a strong feeling on the part of the Commissioners to afford the people of Shields every facility. There were some subsequent matters upon the subject of that quay, 3626.—Does not know the number of quays in South Shields, 3628.—Has certainly not taken any part personally in opposing the endeavours of the Shields people to get quays there. Witness will give them every facility, 3629.—As regards the Commission, it depends very much upon the question before the Board, whether this end of the river has the majority of votes, 3630.—As to there being ten of the Commissioners whose place of business is entirely at this end of the river, knows no difference from one end of the river to the other. Never has, and never shall view it in any other way than as an entire measure. This is the only answer witness can give to the question, because there is no such feeling with the people, even in Newcastle, 3631.—Is bound to believe, as regards Jarrow Docks, that the opposition was to the docks, and was not simply confined to the necessity for some compensation in respect to tidal water. The cause of the Royal Commission is neither more nor less than the Jarrow docks, 3632.—That is their assertion in the memorial. Captain Purdo stated to witness in the Commissioners' meeting room, "If I had got Mr. Rendel's diagrams Jarrow Docks never would have been made," therefore concluded his object was to prevent the docks being made, 3633.—According to the scheme sanctioned last year, promoted and supported by the York, Newcastle, and Berwick Railway Company, does not recollect over how many acres they obtained power, 3634.—Not 350 acres, that is the whole amount of the slake, 3635.—A considerable portion of it, 3636.—Believes there had previously been a scheme for docks, when a less quantity was taken, 3637.—Does not think that the opposition of the Admiralty and those who acted with Captain Purdo was founded on the absence of necessity for their taking a larger quantity of land than they had done on a former occasion. Has not seen the Bill since it was passed, but there are in it 15 or 17 clauses to protect Mr. Stevenson's works from the operations of this dock. Mr. Stevenson says 5, perhaps it may be 5. Captain Purdo, residing at Sunderland, and remembering that if this quantity of coals was not shipped at the Jarrow Dock it would most certainly be shipped at Sunderland, and Mr. Stevenson having his works within the space where the docks would be made, these gentlemen lay themselves open to suspicion as to the motives which have actuated them in the steps they have taken about the Jarrow Dock, 3638.—Witness approves the Jarrow Docks, 3639.—The expenditure already made in respect of the piers was upon the authority of the Commissioners, and not of Mr. Walker or any one else. Has no objection to Mr. Walker. These were expenses which must have taken place under any circumstances, 3640, 3641.—It is only something preparatory, 3642.—Mr. Walker was consulted in the purchase of this land for stone. He went down and saw the works; believes he saw the stone, 3643.—The expenditure already incurred for the piers was undoubtedly upon the authority of the Commissioners themselves, 3644, 3645.—The Piers Committee do nothing of themselves that they do not bring before the next meeting of the Board, 3646.—Witness said he believed there were three river lines; that the plan to be laid before the Commissioners is to contain two or three lines, and in distinct colours, so that they can in their report to the Royal Commissioners show which colour they recommend to be continued up to Newcastle Bridge, 3647.—Mr. Brooks' report of July 1851 was accompanied by a chart with river lines. Every Commissioner has a copy of these plans, and witness has examined them again and again when he has not been satisfied with what has been done at the meetings, 3650.—Did not say that during the inquiry now pending, the River Lines Committee have agreed to lines. It was the desire on the part of the majority that every information they could give, should be laid before the Royal Commission which was coming down here, therefore Mr. Brooks was to do all he could to get the thing brought fairly before them, 3651.—So far as witness can recollect, they have always had one River Lines Committee; it has been a continuous Committee, 3652.—It may be two or three months since the last meeting of the Committee.—In 1852 the Committee was composed of Mr. William Hunter, witness, Mr. James Cochrane Stevenson, Captain Purdo, Mr. John Robinson, Mr. Stephen Lowry, and Mr. Matthew Poppelwell. Believes the same Com-

COWEN, JOSEPH—*continued.*

mittee has been continued ever since; they are re-appointed every year, 3653.—It has been a River Lines Committee for the purpose of selecting from these plans the lines which they considered would be the most advantageous for the river to be carried out, 3654.—Means the River Commissioners, 3655.—Does not know that they have ever, as a Committee, adopted either Mr. Rendel's or Mr. Brook's system of river lines as a whole, 3656.—When application has been made for any particular work to be done, the Committee have not considered only what should be the river line at that particular place; they have had the plans of Mr. Brooks, Mr. Rendel, and Mr. Rennie laid before them, and have determined generally what they thought it should be, having reference to the place, and above and below, and also to a general line for the river, 3657.—To the best of their judgment, the Committee have formed their line according to existing circumstances, referring to those particular plans, and deviating as little as possible from those lines. Knows of no case, except that of Messrs. Palmer, where a deviation was made in consequence of the Hay Hole Docks, from what appeared to be the general line of the river, 3658.—When an application has been made, if no river lines have been laid down at all, the River Committee have then considered what should be the river lines at that point, in reference, of course, to the place immediately above and below it, 3659.—On the plan to which witness has alluded, a line was drawn, as to which he believes there was no difference of opinion in the River Lines Committee, 3660.—It was upon Mr. Brooks's plan of 1843; there were some places where there was a trifling deviation, 3661.—Fancies Smith's new quay is in Shields Harbour, 3662.—Knows the Coble Dean opening, 3663.—And the White Hill Point, 3664.—Believes Smith's new quay is an existing quay, but cannot say, 3665.—Is not aware that the proprietors of that quay are under an engagement to the old corporation and the present conservators to advance it out as far as Mr. Rennie's line, 3666.—Never heard of that before this inquiry, 3667.—Has read Captain Washington's report all through, but does not know that is contained in it, 3668.—Witness's memory does not serve him to show any of the lines of Mr. Brooks' plan of 1849, 3669.—Thinks his attention has never been called to any lines in Shields Harbour; is quite sure that two of the Committee, Mr. Straker and Mr. Poppelwell, who are of the opposition, would have had the most of their own way in carrying out those lines; has always felt it his duty to conciliate them, 3670.—Thinks that one of the objects looming in the future, will be to have docks above Tyne Bridge, 3671.—Does not recollect what the Commissioners have done in Shields harbour. No doubt the accounts show, 3672.—The works that the Corporation had included in the Bill which they introduced in 1850 were according to Mr. Brooks' plan; it was before Parliament; it appeared in the committee room, 3673.—The plan there was the plan before Parliament. The Committee were not wedded to those lines, but the application for that Act showed certain improvements which the Commissioners were to go on with, 3675.—The nature of the powers of the Commissioners for preventing nuisances is explained in the Act of Parliament. Believes nothing is to be deposited within three feet of the edge of any quay. When any one has been detected putting anything into the river, he has been brought before the magistrates, 3676.—Says distinctly that the Commissioners have taken great pains to effect that result, 3677.—In many cases they have done it, 3678.—In his own case, 3679.—Was not proceeded against, but has taken care that his own men should not infringe the law, 3680.—Does not know a case where it has been found necessary to put in force that provision against a person on the Tyne, 3681.—In many places on the river, opposite the restriction in the foreshore, there are chalk walls as guiding walls, half-tide walls, 3682, 3683.—Does not know that there has been any considerable deposit behind those walls, 3684.—Did not say that the letter of the 3d of June was regarded as a personal matter to himself, 3685.—Said that any warmth of his expression in the reply to it might be excused as being under the influence of feeling, 3686.—Sitting at the meetings as chairman or as a Commissioner, does not charge his memory with what has taken place at one time or another. Very likely there may not be anything in the letter which one or other of the Commissioners who signed it may not have complained of, but that by no means makes it right,

COWEN, JOSEPH—*continued.*

3687.—Was no doubt present as chairman of the River Lines Committee on the 19th of August 1854, if his name appears there, 3688.—The minutes, Nos. 2, 4, 6, 7, 8, 9, 10, 11, were unanimously adopted at that meeting, 3689.—"The 5th. The tail of the Durtwich Sand to be dredged." No part of it has been done, 3690.—Was not present at the meeting on the 24th of August 1854. Quite disapproved of the resolutions Nos. 14 and 17. Is most conversant with that part of the river then referred to, and it was understood witness ought to have been present, and it has not been attempted to carry it out, that part still remaining open, 3691.—On the other resolutions there was no difference of opinion, 3692.—Has not examined that plan, 3693.—When reference is made in resolutions of that kind to the plan, understands it to be the plan usually produced before the Commissioners, 3694.—The resolutions of either of those Committees, as regards the river lines, have not been brought before the Commissioners; it was thought desirable to suspend them in consequence of the business necessarily going on before them. The Committee were to prepare a short report and bring it with the plan and lines upon it before the Commissioners, 3695.—If these resolutions of the Lines Committee had to be acted upon, the first step necessary would be to take them before the Commissioners, 3696.—Does not think the improvement of the river has been much retarded by the disputes which have taken place between Newcastle and Shields. It has to a certain extent, but not much, 3697.—It is desirable that those disputes should now cease, 3698.—By forgetting past disagreements, a general plan might be arranged and pursued by the Conservancy for the improvement of the river, 3699.—Is fully aware that the Commission in its report can merely suggest changes which must afterwards be carried through Parliament, perhaps with much expense and opposition. A Bill going to Parliament, having reference to a change of the constitution would bring applications from all the landed proprietors for a change in the constitution of the board, 3700.—The greatest benefit which can be conferred on the Tyne is to leave the Commissioners alone. If not interfered with, the Commission will work well, and accomplish all that any one could fairly expect from it, 3701.—The Committees in the Tyne Improvement Commission Board are very numerous, 3702.—There are the River Lines Committee, the Finance Committee, Police and Ballast Committee, the Moorings Committee, the Piers Committee, the Howdon Dock Property Committee, the Northumberland Dock Committee, which is rather an important one, and the Dredger Committee. The Commissioners have some property at Howdon Dock, 3703.—That is a division of labour, 3704.—Those Committees are appointed at the beginning of the year for the year, 3705.—They keep distinct records of all their proceedings. Mr. Clayton does not generally attend them. The accountant goes and takes down all the resolutions agreed to, 3706.—They are signed by the chairman, and are copied into a book which is brought before the next Commissioners' meeting, 3707.—Every one of the Commissioners has the power of referring to the minute book of their proceedings, and if he is at a Commissioners' meeting he hears them read over, 3708.—The plans and maps of every sort connected with the Conservancy are accessible to any member of the Commission at any time, 3709.—At the meetings, when discussing anything which is to be referred to the plan, the plan is brought down stairs and laid upon the table, or opened out, 3710.—It is on account of the expense that they have not complied with the clause in the Act of Parliament which obliges them to have a plan. In the clause it says "with all convenient speed;" that does not bind them down to time, and seeing that unfortunately what are to be the river lines from one end to the other are not agreed upon, the main motive of that has been that they should bring before the public a complete plan; the docks and piers are new works, 3711.—Could not have better materials for a plan than they possess in Mr. Comrie's and Mr. Calver's plans; the only link now wanting is the Admiralty line of the Jarrow Dock. With respect to Mr. Comrie's instructions, was present on two or three occasions when he was with Mr. Clayton, who, as well as witness, was exceedingly desirous that the plan and the soundings he took should be put in red ink, to represent exactly the present state of the river, as compared with Mr. Rennie's and Mr. Rendel's. Mr. Rendel's of 1849 was what they had then to do with, and it is but justice to Mr. Brooks

COWEN, JOSEPH—*continued.*

to say that he was not present when those instructions were given.—Puts in an authentic document upon the export trade last year, showing about 35 per cent. increase, and another table, showing that they at Newcastle pay a greater amount of duty than at Hull, though the latter is a first class port, and Newcastle a second class, 3712, 3713.—Has no document showing the amount of tonnage which stops at Shields, 3714.—Denies that there is generally a majority in the Commission in favour of Newcastle interests. There is no such limited view taken by the Commissioners generally. In the minutes read to-day, on one occasion, one of the Newcastle people voted with Shields, 3715.—Localities and interests get divided, but there is only in the borough of Tynemouth a very great hatred to the corporation of Newcastle, 3716.—Cannot call it an opposition of interests, because witness maintains that the interests of both parties are identical, 3717.—Anything that the Committee does, comes before the General Board, and they will take their view of the matter irrespective of what the Committee does. The Committees have powers to do certain things, but those are to a limited extent, 3718.—Knows of no division of opinion in the Commission as to the appointment of Committees. They always endeavour to appoint parties who best understand the work. For instance, with respect to the piers, there are two Commissioners for North Shields, and three for South Shields. There have always been two members of North Shields, and two of South Shields upon that Committee, and now there are three members of South Shields. That is purely under the impression that being located at the mouth of the river they would understand the thing better than those farther up the river would do, and that, at any rate, would give a preponderating influence if it were necessary, 3719.—There has been every possible arrangement made for enabling these Committees thoroughly to represent the interests in which they are most concerned. Does nor recollect ever to have had a division or dispute upon the Committees. They occasionally meet at North Shields, and occasionally at South Shields, to look at the piers and at what has been done. The piers' meetings have been once a month, but it has been thought lately they should be once a fortnight, not compelling all the members to attend, but those upon the spot could attend whose local interests were most closely identified with it, 3720.—Does not know that witness, as the head of a body, has greater facility in obtaining information as to plans and maps than other gentlemen, because there is not an instance where any person wants to have anything which he cannot and does not get. Makes a special point of facilitating it. With regard to Captain Purdo's matter about the tidal observations, finding they could not get the information at the Trinity House, over which they had no control, witness said, "Captain Purdo shall have all that we have the means of giving him." Saw the harbour master of Shields, who had a tidal register, of which he promised to send a copy to the Board every month, and witness undertook to hand it over to Captain Purdo. He did so, and this copy for last month he handed to the Captain, who gave it back. It was not information that the Captain wanted. Gives in tidal register at North Shields, December 1854. If any one will bring forward a motion by which it can be better got at, the greatest facility would be given to him by the Commissioners, 3721.—Shall soon be able to furnish the public with maps at a shilling each. The delay hitherto has been partly on account of the expense, and partly on account of the wish to issue them correctly, 3722.—In every instance of any one offending against the Act for throwing rubbish into the river he has been taken before a magistrate, 3723.—The Commissioners have stated again and again that that clause of the Act should be carried out most rigidly. There are printed bills issued, threatening the consequences to any person detected in doing it. They have policemen up and down the river daily, and they have fined many people. It is a mistake to suppose that they have not done so, 3724, 3725.—There was a Bill brought in some years ago for docks at Tynemouth, 3726.—The majority of the Commissioners and the whole of the South Shields people considered that they would be injurious to the port and to the river. Believes every one of the Commissioners of South Shields spoke against it. At any rate Mr. Clay did, upon the principle that it was so near the mouth of the river, so near the bar, and especially pending the formation of piers, that it would have been a most injudicious step to take, 3727.—That was the only reason why the Commissioners voted against it. They had no idea of preventing the people of North Shields from getting docks, 3728.

COWEN, JOSEPH—*continued.*

COX LODGE:

Is one of the first staiths down the river from Hebburn Quay. The water is very deep there, but wants widening, *ib.* 1311–1314.—The new channel opposite Cox Lodge is a little wider, *Calver*, 1694.

COX LODGE AND HEATON STAITHS:

The works there were carried out to Mr. Rennie's line before witness came on to his duties. Witness's line coincides with Mr. Rennie's there, but would have preferred carrying the works further to the south, and not having any works on the Hebburn Quay side, *Brooks*, 2083–2087.—There was some dredging there to widen the channel, *ib.* 2223.

CROSS SECTION:

Where the stream of the river is oblique, a cross section would not give the true power of discharge in that part of the river, *Brooks*, 2365.—Cubical capacity of the river is all given in Mr. Rendel's calculations, which were delivered in, *ib.* 2419.

CURVILINEAR CHANNELS:

The deepest water of a river would be more secured by a gently curved channel than by a straight one, *Calver*, 1698.

DANSON, Mr. SIMON. (*Analysis of his Evidence.*)—Has been harbour master of Newcastle for 21 years, 1482, 1483.—Produces a list of arrivals, which goes back to 1848, 1486.—It commences in November 1848, 1487.—These books contain the arrivals and the draught of water of all vessels that come up to no other part of the river than Newcastle Quay; these books were kept for the express purpose that no undue advantage might be taken of the ships' turns, 1488.—They are turn books, 1489.—Recollects very well when the corporation had the first dredging machine. The first one which they had was a spoon one. Thinks that would be about 24 or 25 years ago. The next was in the latter part of 1836; it was a steam one, 1490–1493.—The corporation got another afterwards. They worked the first one a little while, and then she was laid by for some years, and then sold unfortunately at a loss, 1494.—Believes she was sold under the advice of Mr. Brooks, who was then engineer, 1497, 1498.—Remembers Mr. Brooks introducing his system of jetties, 1499.—That dredging machine was sold, because Mr. Brooks advised the corporation of Newcastle that the dredging machines would be no longer required, because his jetties would answer all the purpose, 1500.—Witness said from the first, when these jetties were put up, that they would do a great deal of harm to the river, and told them exactly what they would do; that they would fill up the Bill Reach, and instead of draining the sand from Hebburn Shoal they have made it worse, 1501, 1502.—The first serious obstruction in the river that witness recollects was the Tyne Main, 1503.—The following one, Ellison Main, was not so bad; the Hebburn Shoal happened to be the worst for a considerable time, 1504.—Some 20 years ago Hebburn Shoal was the first obstruction from the sea, 1505.—Jarrow is the first from the sea now. It has been very bad recently; but there has been one which has risen a little higher up, 1506, 1507.—The channel has become considerably narrower lately; at present there is a little more water, but it is very narrow, 1508.—Everything that has been done to the river has been by the dredging; the jetties have been of no manner of use whatever, 1509.—The mid channel is a little better by dredging, 1511, 1512.—Wishes to see the river made a good river. Has said from the very first that the jetties, if put up, would be a great injury, 1513, 1514.—Has never expressed himself dissatisfied with Mr. Rennie's views, 1515,—Did not say the removal of Hebburn Shoal had filled up the Bill Reach; said the jetties had filled it up, 1516.—Hebburn Shoal has gone both up and down. Witness has no doubt in summer again it will appear in their river, 1517.—Hebburn Shoal is the lower part of the reach. The Bill Reach is from Hebburn Quay end up to Bill Point, 1519.—Witness pointed out the precise spot, 1520.—Witness pointed out where the Tyne

Danson, Mr. Simon—*continued.*

Main Shoal was. It was at St. Peter's, 1521.—That is partly gone; but the sand does accumulate every year, more or less. It comes and goes; it is well adrift now, 1522, 1523.—There was one above Bill Point, Walker Sand. That sand is partially lying there yet; there is a half-tide groin taken down on the opposite side. The sands generally move in the river; every spring tide makes an alteration in those sands, 1524, 1525.—The heavy freshes bring the sands down, and then the spring tides in summer take them up again, and there they lie, 1526.—Thinks the river now is better than it has been for some time, 1527.—Thinks that that reach is better, 1528.—A great part of the Cockcrow Sand has gone away with the last fresh, 1529.—There is Willington Sand on the north side. It is worse than it was. Has seen 16 feet there at low water, and now it is almost dry, 1530–1532.—The channel is altered to the south side, 1533.—Has known the river almost 36 or 37 years, 1535.—Knew it at the time of Mr. Rennie's survey in 1813, 1536,—The Long Reach is a little flatter now than it was for some time, 1537.—It generally alters. It may be much about the same as it was 40 years ago. Cannot exactly say, 1538.—Will not say whether it is better or worse; it is shoal, 1539.—Thinks Jarrow Sand is the same at present as it has been for the last four or five years or more; but has known seven or eight tiers of ships lie down here afloat at low water, vessels of 10, 11, and 12 feet, where there is nothing but sand, 1541.—The lower part of the Long Reach is a little worse than it was, 1542.—It would be very easy to dredge the bar, to make the bar deeper, 1544.—Knows no reason why it has not been done; but recollects about 19 years ago he took a steam boat down and got a set of boring rods, and got some pilots with him, and went and bored on the bar. Bored 4 feet and 4½ in two places, and did not come to any rock, or anything but sand. A swell came in, and his apparatus gave way, or he might have got lower, 1545.—An attempt has been made to improve the entrance of the Narrows. It has been at different times spoken of, and a diver went down there to a shoal lying there called the Stones, 1546.—No attempt has been made to improve the Narrows between the two points; but witness has seen the point on the north and that on the south side gone away to a considerable extent, 1547.—Has never heard any reason assigned for not making the Narrows wider. Thinks the north side is a good protection to the harbour, and that if the point was all dredged away, it would be a great injury to ships in the neighbourhood; it is a great shelter to them; it breaks the sea away, particularly away from the south-east, 1548.—Not more than two ships can lie in Peggy's Hole at a time, because the range coming in throws the ships over, 1549.—If the middle ground were taken away there might be many more ships there; it is the middle ground which throws the ships all over to the north, 1550.—Supposing the north side of the Narrows removed, or part of it, so as to make the Narrows wider, and the middle ground also removed, it might affect both the first, second, third, and fourth berths in Peggy's Hole, 1552.—Has seen the ships break their anchors, even lying four berths up, 1553.—Thinks there are generally about 800 ships lying there, 1554.—Four tiers, containing in the outer part three or four ships in a tier; about 16 ships. There is not so much water there as there was, 1555–1557.—The last entry is a ship consigned to Mr. Ormston, drawing 14½ feet. Mr. Ormston is one of the Commissioners, 1558, 1559.—There may be another 14½ ship in the book. There was a Danish vessel which came up; expects she is there; they wanted to bring her up; she was 15 feet water, and they lightened her, and took part of the cargo forward, 1560.—A ship drawing 14 feet 6 came up to Newcastle Quay on Saturday. Here is the captain's own handwriting, 1562.—Consigned to Mr. Ormston, the Commissioner, 1563.—She came up close to the bridge, 1564.—The "Wentworth Beaumont," drawing 12 feet 11, came up at a very good neaptide the week before last. The wind was from the eastward, 1565–1567.

Datum Horizontal Line:

Explanation of it, *Murray*, 4693-4701.

Datum Level:

Mr. Rennie's datum level had reference simply to the Tyne itself, and not to any levels on either side of it, *Calver*, 1797.

Depth:

With regard to that, formerly vessels stuck on Tyne main shoal, drawing less than 10 feet water; and now vessels can come up, drawing 12½ feet, at the same tide, *Dunn*, 3235.

Disputes:

Between Newcastle and Shields retarded the improvements of the river, *Stevenson*, 1443.

Docks:

Is decidedly in favour of docks wherever they can be produced, *Straker*, 7,8.—Northumberland and the piers are the only important works going on since the new Commission came into operation in 1850. They are under the sanction of the Admiralty, *Stevenson*, 1216-1218.—As chairman of this Commission, felt bound to support the Jarrow Docks; because, upon inquiry, he found that within three or five years of the formation of these docks, half a million tons more of coals would be shipped in the Tyne than if there was no dock at all, and that with coal dues and pier dues the River Tyne Commissioners would get 2,000*l.* a year irrespective of other things, *Cowen*, 3616.—Has always advocated the formation of docks in the river very strongly for the last twelve years, and thinks it is the universal opinion amongst those who are acquainted with the trade of the Tyne, *Stephenson*, 4224.

Drainage:

Of the country has improved in recent years, *Murray*, 4750.

Dredger:

In the time of the old corporation, they actually employed a dredger to raise the sand up and to drop it again, that it should be carried away out of the river. The steamers act something in this way, *Straker*, 879.—There is at present one dredger in the river, worked by steam, *Clayton*, 3540-3541.

Dredging:

The dreging to let the Sardinian frigate down cost the Commissioners about 600*l.* or 700*l.*; there was about 20,000 tons of material taken out, *Poppelwell*, 676, 677.—Wherever it has been done it has had good effect, *Poppelwell*, 717.—Has gone on in the Tyne since 1836 or 1837, *ib.* 759.—There has been much more dredging of late years, *ib.* 762. In the neighbourhood of Hebburn Shoal; Mr. Brooks' reports upon it. There has been a great deal of dredging thereabouts, *Stevenson*, 1146–1163.—Under the head of dredging in the first three years there is 11,604*l.*; puts down half the cost to landmaking, *ib.* 1280, 1281.—The corporation had the first dredging machine about 24 or 25 years ago, *Danson*, 1491.—Account of the dredging done to enable a valuable frigate to be got down from Dent's Hole, *Brooks*, 2221.—There has been very little dredging in the main channel, *ib.* 2458.—Never recommended dredging when allowed to construct works to drive the sand away, *ib.* 2600.—In 1854 the dredging was about 4,000*l.*—The expenditure generally lies between 3,000*l.* and 4,000*l.*, *ib.* 2619.—Generally estimates it at 9*d.* a ton, *ib.* 2641.—The great expense is the maintenance of machinery and craft, and the deposit of material, *ib.* 2643.—Is much cheaper in the Wear, but the system is quite different; there it is only carsed at the harbour's mouth and carried to the sea; in the Tyne the system is to cut a uniform channel and endeavour to make a level bed, *ib.* 2645, 2646.—The Act of Parliament provides that no ballast shall be delivered within two miles of the bar, *ib.* 2650.—If witness were allowed to deposit the ballast between the groynes, could do it much more cheaply, *ib.* 2651.—For three or four years the cost has been more than double the sum expended on river works, *ib.* 2658.—Is obliged to expend 66 per cent. of the amount allowed for engineering works on dredging, because the works are not carried out, *ib.* 2661.—The dredging on the river Clyde is one of the principal sources for increasing its depth, *Ure*, 3099.—Would not be so effective without walls, *ib.* 3133.—There was a good deal of work done in the shape of dredging between 1819 and 1842, *Murray*, 4612.—Dredged in the year between 100,000 and 150,000 tons; it is done by steam dredgers put into hopper vessels and towed out to sea by steamers; little or none is put ashore; the average cost per ton for raising and depositing at sea is 4*d. ib.* 4633–4673.—They could not go to sea and back again to the

DREDGING—*continued.*

higher part of the Tyne in one tide, therefore they would require more hopper vessels there than at Sunderland to carry the dredged material to sea, *ib.* 4678, 4679.—Is carried on at Sunderland during eight or nine months in the year, *ib.* 6690.

DUES:

The corporation do not enjoy any of the dues upon shipping coming into the Tyne. They gave up to the commission all their dues upon shipping, *Clayton*, 3469, 3470.—The commissioners receive a ballast due of 16*d.* per ton for removing and depositing ballast, *ib.* 3530.

DUES, COAL. *Stephenson*, 1273–1276.

DUNN, Mr. CHARLES. (*Analysis of his Evidence.*)—Has been a wharfinger of Newcastle since 1821, 3232–3233.—The condition of the channel of the river between Newcastle and Shields is greatly improved, 3234.—Formerly vessels drawing less than 10 feet water (going from Newcastle to Shields) would stick on Tyne Main Shoal. Now the shoals are removed, vessels drawing 12½ feet can, both up and down, navigate in one tide, 3235.—Has observed the foundation of the high level bridge to be bare a foot and a half more than at the time the bridge was built. The tide appears to ebb further out. Remembers the piles being pulled up with a steam machine, and now they can be pulled up by hand, 3236.—The burthen of sailing ships coming up to Newcastle Quay has increased. Can speak particularly of vessels in the London trade, which were formerly about 200 tons burthen, and now are from 300 to 420, 3237, 3238.—They come up full loaded, but the cargoes from London are not so heavy as those which they ship from this port to London. A vessel would arrive with a cargo drawing 13 or 13½ feet, but with a cargo from here to London she would draw 16 feet, 3239.—The custom is to take in a certain part of the cargo at Newcastle Quay, to allow the draught of water for the ship to go down; and at Shields to complete the cargo, 3241.—Knows Hay Hole. Believes it is in the Borough of Tynemouth, 3242, 3243.—Has a large business at Newcastle, 3245.—Is aware that in the contests which have been going on between Shields and Newcastle, the great cause of complaint has been that not more than one tenth of the whole tonnage that comes in across the bar ever passes out of the Borough of Tynemouth, or above Hay Hole; but knows nothing about it, 3246, 3247,—Believes it has been asserted, but has no means of ascertaining the question, 3249, 3250.—Has not heard it contradicted, 3251.—Is not a member of the corporation. Does not remember a pamphlet by Mr. Armstrong, Chairman of the River Committee, 3252.—It is possible, upon a very high tide, that 20 years ago ships drawing 14 or 14½ feet water could come up to Newcastle Quay, 3253.—It would not be an ordinary tide, 3254,—The ordinary draught of water of vessels coming up to Newcastle Quay is from 11 to 13½ or 14 feet, but it would depend upon the quantity of cargo on board, 3255.—Witness's vessels are the largest that come to the quay, 3257.—They do not entirely go down with steam tugs, sometimes they sail down, whether large or small, 3258, 3260.—In 1828 Tyne Main Shoal was very bad, 3262.—Many means were tried to improve it. A London dredger was had down, and a kind of rake behind a steamer, and since that time the sand has washed away; it has never been any nuisance to witness, 3263.—These observations spoken of are his observations by the eye upon the foundation of the high level bridge, 3264.—Has a ship called the "Wentworth Beaumont," 3265.—She draws 16 feet when laden going up to London. In coming from London the ships have less draught of water, 3266.—She has come up with neap tides, 3267.—Believes with 12 feet 10 draught, 3268.—Was down the same day the Sardinian frigate went down the river, 3269.—The "Wentworth Beaumont" sailed past her opposite St. Anthony's Point, 3270.—It is a difficult part; a dangerous position for such large vessels passing in a narrow channel together, 3271.—Some dredging had then taken place certainly, 3272.—Is aware that by the old tonnage ships might be built of any depth, and it had no effect upon their tonnage, 3273.—There were no means of judging of the draught of water by the ship's tonnage 30 years ago, 3274.—Was replying upon the register tonnage of ships by the old plan, according to the length and breadth; formerly in tonnage depth was of no consequence, 3276.—A ship of 200 tons, according to old measurement, might have drawn more water, and carried more cargo than a ship of 300 tons at the present day, 3277.—Much larger ships come to Newcastle now than did formerly, 3278.—And drawing more water, 3279.

DUNN, Mr. CHARLES—*continued.*

DURTWICH SANDS:

There is an accumulation, no doubt, at the Durtwich Sands, and witness conceives that inasmuch as it closes up the swashway, which a portion of the tide went over, in proportion as it silts up, it turns more water into the main channel of the river, and consequently improves it. It may affect the question as one of landing places or some local interest, *Stephenson*, 4222.—There is a deep channel there, *Rendel*, 4045.—Things are going wrong in this part of the river, *ib.* 4048.—The channel is wider here than in 1849, *ib.* 4049.—Appears to be moving down the river, comparing its position now with what is shown in the survey of 1849, *ib.* 4275.

EBB TIDE:

Is not so strong as it was years ago, *Straker*, 378.—Continues some time after the flood has made, and produces a strong eddy at the mouth of the harbour, *Rendel*, 4077.—The set of the ebb outside Tynemouth Head is northwards, across the Herd Sand eastwards, and off Tynemouth Head north-east, *ib.* 4320.

"ELSWICK:"

Brought up the "Elswick," a trader, from Shields to Newcastle, about two months ago, during a neap tide, *Freeman*, 3029–3031.—The draught of the vessel was 13 feet abaft, 12 feet 10 forward, *ib.* 3032,

ENCLOSURES:

The enclosures of Messrs. Palmer and Messrs. Leslie are the only ones authorized by the Commissioners, *Cowen*, 3605, 3606.

ENCROACHMENT:

Thinks what the "Queen's Commission" calls an encroachment is the best mode of improving the river, *Stephenson*, 4101.—Captain Purdo has applied to the Commissioners for the area of encroachments to be furnished, *Brooks*, 2270.—Thinks it would be dangerous to furnish information with regard to encroachments; it might subject private parties to legal processes, *ib.* 2274.—Captain Purdo's motion of the 8th of December for a return of encroachments was passed unanimously; on the 23d it was disposed of by a motion of Messrs. Carr and Rayne, that it was useless and ought not to be granted, by votes of ten against two, *Clayton*, 3444, 3445.—Palmer's encroachment was said to be for a temporary purpose, *Macartney*, 4412.—Mr. Rendel and Mr. Rennie are agreed with regard to them, with this difference: Mr. Rendel prohibits cross jetties, while the other admits them, *Purdo*, 572.—It makes a difference in principle in favour of Mr. Rendel, *ib.* 573.

EQUINOCTIAL SPRINGS:

Has seen no change take place generally in the sands of the river; thinks this applies as far as Shields, *Brooks*, 2531–2533.

ESTUARY OF THE TYNE:

Is small compared with Portsmouth harbour, *Purdo*, 639.

EXTRACT:

From Mr. Brooks' report, *Brooks*, 2541.—From a report of the Tyne in 1752, *ib.* 2545.

FINES:

The fines to parties throwing rubbish into the river goes to the informer, *ib.* 2617.

FINANCES:

Looking at the financial statement of last year, believes the Commission have exceeded their revenue by 2,000*l.*, but believes, when wound up to the 31st of December, it will be found rather a good year.—*Cowen*, 3619.

Flood and Ebb:

It is a great improvement to lead both currents into the same channel, *Ure*, 2882.—Tide: Brings a great quantity of sand into the harbour, *Brooks*, 2535.—Could not have the effect of making out a channel for a river; the tendency would be to bring material into the river, *ib.* 2548.—As far as the flood tide question is concerned, and the direction of it, that is a question upon the position of the piers. In all the harbours which witness knows, where the projecting headland is on the opposite side from that along which the tide comes, acting as a groin to throw the tide earlier into the harbour, he does not know of a bad bar; instances Montrose. In all cases where the object is to get a large volume of tidal water quickly up a river or estuary, it is of the greatest importance to arrest the young flood along the coast, and to throw it into the harbour. Gives several instances of the advantages arising from this, *Rendel*, 3957.—Runs from north to south across the mouth of the Tyne, *ib.* 4073.

Foreshore Rights:

Concurs with Mr. Allhusen's motion respecting those rights, to the effect that if made into land at all, the value of such land should be proceeds applicable to the general conservancy purposes, *Straker*, 134.—The corporation are owners of very large property on the foreshores, *Clayton*, 3344.—The objection of the landholders to the alterations of the foreshores is a bonâ fide objection, *ib.* 3527.

Freeman, Joseph.—(*Analysis of his Evidence.*)—Has been a river pilot for 36 years, 3024.—The condition of the navigable channel of the river Tyne has much improved; it is straighter; it is not quite so broad, but it is deeper, 3025, 3026.—Speaks of from White Hill Point to Newcastle bridge, 3027.—The first shoal is at Jarrow, the last at Tyne Main; there is not more than five or six inches difference between the shoals, but they are better by a foot than he has known them the last two years back, 3028.—Brought up the Elswick, a trader, from Shields to Newcastle, about two months ago, during a neap tide, 3029–3031.—The draught of the vessel was 13 feet abaft, 12 feet 10 forward, 3032.—It flowed at half-past 10 at Shields, and at half-past 11 at Newcastle, that is about the dead of the neaps, 3033, 3034.—Has seen many times very little difference between the springs and the neaps, 3035.

Friar's Goose Point, Bill Point, and White Hill Point:

The reason nothing has been done with regard to moving these points is, that the Commission have not got the money, *Cowen*, 3598.

Fresh:

Has a distinct observation of a very heavy fresh at Newcastle. The maximum was 25,200 feet per hour; that is, 5 statute miles, *Calver*, 1837.

Freshes:

Are the governing power in the Tyne. They run down four or five times in the year, during the entire time of the flood tide, *Brooks*, 2513–2515.—On the convex shore, at Gateshead, there was a mud and sand bank of considerable extent; when a fresh came down it was carried out almost like a wall, *ib.* 2551.—The river is improved by a fresh, *ib.* 2555.—After the freshes there is a greater depth of channel, *ib.* 2560.—River is better in winter than summer, *ib.* 2562.—Under proper control ought to be the governing power of the river, *Taylor*, 2791.—One fresh discharged 80,000,000 tons in 24 hours. That fresh was 14 feet at Newcastle Quay, and the rate per hour was 24,600 feet—between four and five miles an hour; four times that of an ordinary tide, *ib.* 2792.—On the Clyde are very sudden, and reach very high; at other times the supply is but small, *Walker*, 4453.

Fresh Water:

The amount of fresh water that falls is about 1,309,000,000 cubic yards in a year, in six, seven, or eight floods, *Taylor*, 2849.

Frontage:

Mr. Ellison, the Dean and Chapter, and the Corporation, own the great bulk of frontage which remains to be filled up, *Stevenson*, 1464.—Is important to the

Frontage—*continued.*

landowners, *Straker*, 223.—Refers to a case to show the result of half-tide walls with regard to frontage, *ib.* 224.

Fryer:

Witness first produced a plan by Fryer, the date of which is 1782, which contains a series of soundings taken at low water, *Brooks*, 1982.

Full Tide Jetties:

Were adopted in the Clyde, *Brooks*, 2435.

Full Tide Walls:

Is of opinion that full tide walls ought never to have been allowed to abstract land to any extent, except for the purpose of docks, or for some great commercial purpose, *Straker*, 83.—Have been brought into operation on the River Ribble, a certain distance below Preston, *Stevenson*, 1366.—Witness's opinion is in favour of full tide walls, *Ure*, 2883.—The result anticipated from them is a higher level at Newcastle, *Rendel*, 4364.

Gauges:

The tide gauges were levelled by Mr. Comrie and witness. They are boards about nine inches in width, and the fifteen feet was a dead level throughout, carefully levelled and checked over. They were divided into inches, and the observers took the tide every five minutes, day and night. Can vouch for the perfect correctness of the gauge at Newcastle. Has put dotted lines where discrepancies occur through the men having left their posts from fatigue or cold, *Brooks*, 1817–4825.—The Commissioners have two self-registering tide gauges, but they have never been put up, *Stevenson*, 1259.

Graham (Sir James) letter of, *Clayton*, 3323.

Grants:

In 1840 or 1842, by permission from the corporation of Newcastle, built a quay, which cost between 4,000*l.* and 5,000*l.*, with a view of obtaining a deep water frontage for his property, and believes it has generally been considered a great improvement to the river. Understands that the Shields people think that the corporation give such grants with the view of improving their own property. They have derived no benefit whatever from this improvement, *Allhusen*, 3732.

Great Yarmouth:

The bar is altogether removed. Witness has had to do with that harbour a great many years, *Walker*, 4554.

Groins or Jetties:

Has always objected to them, *Straker*, 102.—Above Hebburn Quay have done great mischief in the river, *ib.* 326.—One or two above Mr. Leslie's Yard, *ib.* 328.—Gives two instances to support his opinion that the groins cause hills and holes, *Poppelwell*, 829–848.—Describes the difference between groins and training walls, *Rendel*, 4062.—With money and the order to proceed, what remains to be made might be done in two years, *Brooks*, 2634.

Guiding Piers:

Thinks it would be improper to let any docks be begun outside the narrows that are not made in conformity with guiding piers as laid down, *Rendel*, 3974–3976.

Half-tide Banks:

Water running off them into a deep channel between them promotes a scour, which adds to the maintenance of the channel, *Rendel*, 4287.

Half-tide Walls:

Would recommend a half-tide wall as a general rule on the river, *Straker*, 214.—Have great advantages over full-tide walls, *ib.* 312.—Between Newcastle and Narrows have all been formed by river funds, *ib.* 320.—Would have half-tide walls in the Tyne, *Purdo*, 439.—The earth would not become deposited over and above them, *Poppelwell*, 710.—Approves of the prin-

HALF-TIDE WALLS—*continued.*

ciple generally, *Linskill*, 978–982.—States opinion, that if half-tide walls had been formed from the first in the River Tyne the remainder of the basin between the half-tide walls and the shore would have been maintained as a part of the tidal basin nearly in perpetuity with a little careful conservation, *Calver*, 1822.—Witness thinks they cannot be carried out effectually; explains by making a sketch, *Taylor*, 2787.—There are two short lengths of half-tide wall in the lower part of the River Clyde, *Ure*, 3129.—The Commissioners have begun to make a half-tide wall extending down the whole of Mr. Ellison's shores. Mr. Leslie is excluded from his river frontage by a bank of mud, produced by the half-tide wall or other works of the Commissioners, *Clayton*, 3321.—Generally coincided with the minority, as they are called, on the question of half-tide walls, *Robinson*, 3839.—Are preferable to the whole-tide groins now in use upon the Tyne, to prevent the unnecessary loss of back water; was of that opinion in 1851, and is so still, *Rendel*, 3994.—Thinks half-tide training walls the best plan, *ib.* 4064. Does not think half-tide walls would confine the channel and make it uniform, *Stephenson*, 4108.—With regard to improving the navigable channel up to Newcastle at a reasonable cost, thinks it more prudent and more economical to try the effect of half-tide walls first; with the proper width of channel between them, there is a certainty of retaining the necessary area for tide water, *Rendel*, 4279.—There is not so much silting up as with full-tide walls; the breaking of the waves over the half-tide walls prevents the growth of deposits, *ib.* 4390.—Recommends half-tide walls at the lower part of the river where the navigation depends on tidal water, and full-tide walls in the upper part where it depends on the land water. This principle has been carried out in the Clyde, *Walker*, 4448.

HARBOURS:

States why inner piers are essential for improving the Harbour, *Rendel*, 3963.—Thinks inner piers are an essential part of any design for the improvement of the Harbour, *ib.* 3953.

HARBOUR OF REFUGE:

Does not think there is a place between the Humber and the Firth of Forth where a harbour of refuge could be more advantageously constructed than at the mouth of the Tyne, *Clayton*, 3572.—A site for one could not found at the mouth of such an estuary as the Tyne, surrounded as it is by sands, *Rendel*, 4323.

HARRISON, JACOB.—(*Analysis of his Evidence.*)—Has been a sea pilot nearly 44 years, 3036, 3037.—Thinks the harbour is improved near the tiers, both on the south and north side, since the moorings were put down, but great improvements had taken place in Shields three or four years previous to putting down these moorings, 3038–3040.—His branch extends from the bar to White Hill Point, 3041.—The bar is pretty good now, a foot and a half better than the marks, much better than the time Mr. Wake was speaking of, but years previous to that has known it as good as it is now, sometimes better, and sometimes worse. The bar is a very fluctuating thing; there are sometimes great alterations in it in a week or two or three days, 3042.—The channel is easier at the In-sand, which is not so far north as it used to be, but has known it less than it is now, 3043.—The land floods affect the bar a great deal, but not always, 3044, 3045.—The land floods run very heavily into Shields harbour, and sometimes send back the flood tide, 3046, 3047.—In previous years the bar was frequently as good as now. Cannot say when it was the very best, but never knew it bad for so long a time, from no apparent cause, as in 1846, 3048, 3049.—Does not go so high up as White Hill Point, 3050.—The harbour is improved on the south side where the tiers are; when the ships are moored there, deep water comes under them, 3051, 3052.—The water scours under them, and the sand goes somewhere else, 3053, 3054.—Never heard of the middle passage in Shields harbour, 3055.—Knows the Steam Ferry track, 3056.—There is a sand there called the Durtwick Sand, 3057.—Sometime there are five or six ships outside those buoys. If the Durtwick Sand had been there the Steam Ferry would not have gone there at all, 3058.—The ships have gone to another part of the harbour, 3059.—There is sand on the north line of the Steam Ferry. It only draws three or four feet of water. Has heard she

HARRISON, JACOB—*continued.*

occasionally gets on that sand, but never saw it, 3060–3062.—The bar is all sand throughout, 3063, 3064.—If the bar were deepened five or six feet in a week, thinks it would come up again in a fornight, 3065.—There are some feet of sand; sometimes the bar has not been better than the marks, but at short intervals it has changed in depth, 3067.—Thinks the Black Middens go about half way across the river. There is plenty of water there, and does not measure those different things, 3068.—Could no doubt deepen the bar to half a cables' width across, or to a cable's length in width, by scouring it from the Herd end to the rocks, 3069–3071.—It is nothing but soft sand under the Spar Hawk, 3072.—Has known the bar bad, except the Spar Hawk, and the channel has laid right over it. There is no rock there, 3073, 3074.

HARTLEPOOL:

The projecting headland of Yorkshire is several miles south of Hartlepool, and occasions a recoil or heaping up of water into the harbour, *Murray*, 4705-4707.

HAYHILL POINT:

Particulars of the examinations in 1838 and 1847, and two in 1849, of the river between Hayhill Point to above Hebburn Quay, *Calver*, 1578.—Particulars of state of the river between Hayhill Point and Hebburn Quay, *ib.* 1614.—Witness's plan does not agree with Mr. Rennie's at Hayhill Point, *Brooks*, 2311.

HAY HOLE:

The river has changed materially; old charts show that Hay Hole was once a shoal place, and deep water at Jarrow, and the reverse at times; but generally Hay Hole was deep water and a capital shipping place, *Brooks*, 2114.—Mr. Brooks, finding that the works at Willington would shallow these places at Hay Hole, where upwards of a million tons of coal are shipped, still pursuing Mr. Rennie's principle, alters his lines, but before the alteration is carried, out comes the project of Hay Hill Docks, which restores Mr. Rennie's line. This was in 1849; Hay Hole Dock was not projected till 1850, *Clayton*, 3410–3411.

HAY HOLE DOCK:

Was not laid out upon Mr. Rennie's line or any determined line; it was settled at the moment, *Lamb*, 392.—Thinks compensation should be made for the water abstracted, *Poppelwell*, 670–671.—The intention of constructing this dock caused the setting back the line a little more to the south, *Brooks*, 2158.—A modified line, for it would involve altered lines on the south side, *ib.* 2483.—The expenses of extending the staiths and quays to Mr. Rennie's line would be about 50,000*l.* or 60,000*l.*, *Taylor*, 2779.—Will give deep water at all these staiths, *ib.* 2803.—It has not yet been decided among the three contending parties who is to receive the purchase money of the site of the Hay Hole Dock, *Clayton*, 3300.—This dock occupies a bay which Mr. Rennie recommended to be entirely excluded from the channel of the river by a half-tide wall, *ib.* 3309.—Mr. Ellison has a large estate there. The advertisement offering the water frontage upon Mr. Ellison's property was put in by his land agent to let his land, occasioned by the establishment of many iron ship building works on this river, *ib.* 3489–3491.—The interest for the money raised for the construction of Hay Hole Docks was paid out of the capital till the docks were open for traffic, *ib.* 3538.—If the rapidity of the shipping of coal goes on, it will not be many years before it will become a free dock, with the exception of keeping it in repair, *Cowen*, 3596.—Description of the effect of Hay Hole being made a half-tide dock, *Rendel*, 4051.

HAY HOLE POINT:

The commissioners are making extensive docks above there. The general effect of the works must be the reduction of the low-water surface, *Brooks*, 2024.

HAY HOLE STAITHS:

Were much silted up in consequence of the execution of Willington Quay; but witness's works swept away not less than 23 acres of dry sand, *Brooks*, 2111, 2112.—Recommended in 1851 a half-tide dock, *Rendel*, 3993.

HEADLANDS:

Montrose and Aberdeen have them on the south, and the Tay, like the Tyne, on the north, *Rendel*, 4086.

HEADLAND, TYNEMOUTH:

Believes one of the great causes of an insufficient tidal flow up the river is the way in which the tide comes into the harbour with reference to the Tynemouth headland, *Rendel*, 3940.

HEBBURN:

Agreed reluctantly to the extension of the groins as an experiment. A report was to have been made of their efficacy, but it has not been done; the groins are still there, and since then the engineer has stated publicly that he intends to make ground between these groins, *Purdo*, 601.—There used to be deep water opposite Ellison's Quay, but the sand is rising there rapidly, and there will be a shoal there soon, *Brooks*, 2163.—Black Staith. In the early part of witness's employment under the corporation, there was a very bad shoal existing near here, known by the name of Killingworth Shoal; that remained for several years. It had not more than two feet at low water, *ib.* 1983.—Jetties were erected for a temporary purpose. The effect of the contraction is to give a depth of twenty feet water below the level of the datum tide at that part of the river, *ib.* 2191-2193.—Shoal. Is partly removed, *Straker*, 239.—The steamers constantly get aground there, *ib.* 255.—Dredging brought to bear upon it; did not succeed in getting rid of it; but when the jetties were put up with the dredging it did succeed, *Poppelwell*, 781-785.—There has since been a very narrow channel there; the dry lands made since that period is speaking without training walls, *ib.* 786-789.—Extracts from Mr. Brooks' reports respecting it, *Stevenson*, 1140-1145.—Twenty years ago was the first obstruction from the sea, *Dawson*, 1505.—Has been deepened 5 feet 2 inches; it now admits vessels to Newcastle, drawing 1 foot 10 inches more, *Calver*, 1683.—Higher up is in the same condition, *Brooks*, 1983.—Was the standing grievance in the Tyne at the time witness came, *ib.* 1983.—Since the removal of Hebburn Shoal there is the same flow at Newcastle Quay with a clean ebb, as there was in the old state of the river at Hebburn, *ib.* 2206.—Produces a plan which shows Hebburn Shoal; also a portion of the Long Reach, taken from Messrs. Giles and Comrie's survey of 1813, *ib.* 2210.—There has been no dredging there since the jetties were lengthened to the extent advised by witness, *ib.* 2222.—In 1849, Hebburn Shoal acted as a dam, retaining the low water, *ib.* 2719.—Its condition now is very good, *Brown*, 3176.

HEBBURN QUAY:

Had no intention of making any walls between the east end of Hebburn Quay and Black Staith, *Brooks*, 2145.—If Mr. Leslie's encroachment is carried out to witness's lines, the area would be about 44 acres between Black Staith and the east end of Hebburn Quay, *ib.* 2148, 2149.—Mr. Poppelwell proposed the construction of a half-tide wall there as an experiment, which would virtually have the effect of converting this large space into land, *ib.* 2153, 2154.—The present high water surface at Hebburn Quay opposite low water at the broadest part is 957; between the walls 780, *ib.* 4802-4805.

HERD SAND:

People bathing there can feel the sand come in, the current is so strong, *Brooks*, 2541.—Believes if Tynemouth Head were carried a mile further to sea the Herd Sand would follow it, *Rendel*, 3958.—Are not covered till three-quarter flood, therefore the channel is very much confined, *Stephenson*, 4149.—The depositing process proceeds principally during the ebb, *Rendel*, 4294.—It is not brought there by the river; these sands are the *débris* of the coast, brought along by the flood stream and northerly winds, and lodged here, being protected by the Tyemouth headland, *ib.* 4295.—The outer part of it is covered at a very early time of flood, *ib.* 4332.

HIGH LIGHTHOUSE:

Is under the control of the Trinity House, *Wake*, 3908.

HOPPER CRAFT:

As an engineer thinks there will be difficulty in working these craft in the upper part of the river, *Brooks*, 2664.

HOPPER SYSTEM:

Witness strongly supports it. There were reports upon it in May and October 1852, *Stevenson*, 1221-1230.

HORIZONTAL LEVEL:

Believes in the Tyne the water does not rise in any part of the river above the horizontal level taken from the Narrows up to Newcastle bridge, 4232, *Stevenson*, 4232.

HOWDEN:

Abreast of Howden, where a four feet depth of water has been previously referred to in the evidence as existing, finds only a depth shown of two feet, being about the depth given by witnesses at previous inquiries, *Brooks*, 1983.

HOWDON SHOAL:

Remembers Howdon Shoal as far back as 1832. There might be then about four feet depth at low water time; there was 15 feet at high water. There is now 18½ feet, *Story*, 3185-3188.

HUMBER AND BRIDGEWATER:

Has also charts of, *Brooks*, 4770.

ICE:

Occasionally does damage to ships, but only two or three times during 50 years, *Straker*, 3160.

IMPROVEMENTS, RIVER:

Improvement in the river is due to dredging, and not to the jetties, *Straker*, 112.—Under this head there is 5,643*l.* for three years; of this about 4,400 has been paid for embankments for making land, *Stevenson*, 1280-1287.—If witness's improvements were carried out the tidal volume would be materially increased, *Taylor*, 2772.

INSAND:

Particulars of the river between Insand and the Low-light beach, *Calvers*, 1661.—Attributes it entirely to the ebb tide down Shields harbour not being in the same course as the stream of flood tide through the Narrows. Witness's inner piers would tend to correct this evil, *Rendel*, 4330.

JARROW:

Jarrow, or south side, was one mass of shoal water, *Brooks*, 1982.—Subsequently certain works were constructed in the bight above Jarrow, *ib.* 1983.—The shoal has 18 feet 9 inches at high water, 5 feet or 5 feet 3 inches at low water, *Ure*, 2872.

JARROW BIGHT:

Two jetties were erected there, and the effect of that was to cause an immediate alteration in the state of the navigation, *Brooks*, 1983.

JARROW DOCKS:

Agreed with the Admiralty that there should be a compensation for the water abstracted. Does not think the Admiralty went half far enough, *Purdo*, 634.—Thinks compensation should he made for water abstracted, *Poppelwell*, 670, 671.

JARROW BILL:

Advocates the cutting off of the Jarrow Slake, that the water excluded from the slake should go up the river, *Brooks*, 2332.

JARROW QUAY:

Remembers the various applications that were made, and discussions that took place respecting the encroachments of Palmer and Brothers, and Bowes and Company, near Jarrow Quay, *Straker*, 131.—Thinks the motion for increasing the number and length of jetties in this neighbourhood was lost by a majority of one, *Purdo*, 544, 545.—Always thought that it was meant that the entire extent from the west end of

JARROW QUAY—*continued.*

Jarrow Quay to the Muckhouse should be converted into land, *Brooks*, 2177.

JARROW SAND:

Is the same as it was, *Danson*, 1541.—Opposite to Hay Hole appears to be moving more down the river, comparing its position now with what is shown in the survey of 1849, *Rendel*, 4275.

JARROW SLAKE:

Has no objection to docks in the river; is a friend to docks in every way, but not out of the river, *Purdo.* 624.—A cut was made through the Slake without the consent of the corporation, which was afterwards, by the consent of the Commission, made navigable, *Stevenson*, 1356, 1357.—In an interval of thirty-six years has not altered at all in height or surface, *Calver*, 1826.—Is now the first obstruction, *Danson*, 1506.—Agreat portion of it has only from four to five feet water upon it at high water of the spring tides, *Brooks*, 2128.—Gives reasons why it is not converted into land, *ib.* 2128.—It would be desirable to enclose Jarrow Slake, *ib.* 2421.—Proposed to enclose Jarrow Slake with an amount of tidal water at full spring tides of 2,300,000 cubic yards, *Taylor*, 2763.—Calculated the enclosure there to be 360 acres, with a mean depth of 4½ feet at high spring tides, at dead neaps nothing, *ib.* 2814.—The compensation proposed for shutting out the tidal water from Jarrow Slake consists of the several improvements before mentioned: first, the reduction of the low-water surface by removing the silt upon the present bed of the river, *ib.* 2837.—The whold navigation from Shields to Newcastle would be considerably improved by enclosing Jarrow Slake, *Ure*, 3139.—The average bed of the river from here to Newcastle is about level, *Rendel*, 4056.—It would be most advantageous if Jarrow Slake and every inlet up which the tide flows at present were entirely excluded, as more water would reach Newcastle than does now; it would tend to equalize the period of ebb and flow, *Stephenson*, 4103, 4104.—The good effect of the piers would be counteracted if Jarrow Slake were allowed to be abstracted, *Walker*, 4442.—Some portion is about to be enclosed for the purposes of docks, *ib.* 4443.—There will remain about 230 acres unaffected, after the construction of the docks, *ib.* 4444.—There are several wide places in the river between here and Hebburn Quay, which afford considerable space for tidal water. The depth of water over them at high water spring tides is eight or nine feet, *ib.* 4458–4461.—If moved higher up it would improve the river, but not Shields Harbour, nor the bar; explains why, *ib.* 4464, 4467.—The mud is about half-tide, *ib.* 4470.—The tide leaves Jarrow Slake at a quarter ebb, and reaches the bar at half ebb, *ib.* 4472.—If it be kept open and the proposed improvements upwards also made, the water coming in through the Narrows, and therefore going out again through the harbour to the bar, will be what is due to those improvements and Jarrow Slake, *ib.* 4508.—The abstraction of Jarrow Slake would improve the river above, but would injure it below, but does not think that the improving it above is any justification for injuring it below Jarrow Slake, *ib.* 4547.—Stated, when examined on the Jarrow Bill, that to compensate for the abstraction of the whole of Jarrow Slake, the water ought to be raised ten feet at Newcastle, and that we did not think it would be raised more or so much as one foot by any improvements that could be made, *ib.* 4549.—Adheres to the view, as a general principle, which he took in answer 617 in 1854, *ib.* 4562.—A lateral abstraction of tidal water from the Tyne might be compensated if the low-water mark were lowered so as to leave a larger receptacle to be filled next tide between that low-water mark and the high-water mark, *ib.* 4565–4569.—Would part it a mile or two higher up, *ib.* 4569.—If Jarrow Slake be kept open and the river improved, the water coming in through the Narrows will be sufficient to fill both; but if Jarrow Slake be excluded, the quantity going up will only be that to fill the river, *ib.* 4572.—The moving of Jarrow Slake would not be so much more beneficial as regards the bar, but as regards Shields Harbour, *ib.* 4573.

JETTIES:

Considers them very mischievous, *Straker*, 236.—Mr. Rendel omits jetties. Mr. Rennie supplies half-tide transverse jetties, *Purdo*, 574.—Mr. Brooks advocates full-tide jetties, *ib.* 576.—Gives an instance of

JETTIES—*continued.*

the bad effects of jetties, *Poppelwell*, 718.—Objects to transverse jetties between high and low-water mark, and all other matters connected with them, *ib.* 769.—Shown in Mr. Calver's report is one of two which have since been lengthened, one 66 feet and the other 100 feet, by the present conservators, *Stevenson*, 1084–1089.—Mr. Brooks' statement advising the temporary lengthening the jetties on the west side of Hebburn Quay, *ib.* 1138.—The lengthening of the jetty at the west end of Hebburn Quay received the sanction of the majority of the Commissioners, *ib.* 1320.—Were erected at Jarrow Stake for the purpose of preventing the deposit of refuse matter being scoured away, *ib.* 1340–1348.—Would answer all the purpose, *Danson*, 1500.—The three jetties at Bill Point come very near to the line; the westernmost jetty is not out to its full extent; the depth of water was obtained before going to the full extent. The easterly one is a longer jetty than the two westerly ones, *Brooks*, 2040–2042.—Upon Mr. Rennie's plan they commence at high water upon the shore, and point down to a little above half tide at their ends, sloping towards the channel, *ib.* 2134.—Full tide: Has executed them in the Tyne, his object being to improve the navigation, which cannot be done where it is so bad without making land, *ib.* 2136–2138.—The jetties at Stockton-on-Tees produced such an increase of water that vessels of the same draught could come at neap as formerly, at spring tides, *ib.* 2195.—The jetties at Hebburn Shoal cost 17,000*l.* and were two years building, *ib.* 2228.—Transverse full-tide: Produce great irregularities as regards the currents, particularly in curves, *Rendel*, 4384.—Transverse: Recommended by Mr. Brooks for deepening Hebburn Shoal. They narrowed the channel between Cockcrow Sands and the north shore. Witness did not approve of them, *Stevenson*, 1162–1183.

KILLINGWORTH SHOAL:

Its present condition is very good; better than Hebburn, *Story*, 3179–3181.—Was in a bad condition so late as 1845. The depth at low-water spring tides was then 2½ or 3 feet, *ib.* 3229, 3230.

KILLINGWORTH STAITHS:

Witness's line goes beyond Killingworth Staiths about 60 feet; they are beyond Mr. Rennie's about 60 feet, 2088–2089.—The works at Killingworth do not extend 140 feet beyond Mr. Rennie's line, and 60 feet beyond witness's line; it is a mistake, *Brooks*, 2088–2092.—The works were executed by the owners of Killingworth Colliery, 2093.—They were commenced in December 1844, *ib.* 2093, 2094.

LAMB, MR. JOHN WALKER. (*Analysis of his Evidence.*)—Resides at South Shields, 380.—Was born there, and is now fifty years old, but has only resided there a little more than thirty-five years, 381.—Was one of the first Commissioners appointed under the Conservancy Act, but has now ceased to be a Commissioner, 382, 383.—Signed the letter to Sir James Graham, of the 3d of June, 384.—Cannot say that the existing Commission has worked efficiently, 385.—Concurs in the opinions expressed in the paper handed to him, 386.—Thinks things would have worked better if Admiralty Commissioners had been introduced, as a proper check on the local Commissioners, allowing the Commissioners to elect their own chairman, clerk, and treasurer, 389.—Has never heard of any general system of management having been acted upon, or settled, by the Commissioners since they came into office, 390.—Motions have been repeatedly made to abandon the system of jetties, and to adopt a system of training the river by half-tide walls; those motions have been defeated. No system of river lines had been agreed upon by the Commissioners at the time of signing this letter, 391.—The works have been executed in a desultory way; upon no uniform line. The Hay Hole Dock was not laid out either upon the line of Mr. Rennie or on any previously determined line; it was settled then, at the moment, 392.—Should be slow to express opinion that the works in the river have produced the contraction of the Narrows, but believes it is an undoubted fact that the Narrows are contracted, 393.—Has always heard that the accumulation of ships improves the depth of water, and does not at all deteriorate it, 394.—Does not think it at all affects the quantity of water coming in from the sea, 395.—Thinks he signed the memorial of the 3d Aug., 396.—Should not have signed it if he had not con-

LAMB, Mr. JOHN WALKER—*continued.*

curred in the statements contained, 397.—Witness referred to the motions which have been made before the Commissioners in regard to the disputed point of half-tide or full-tide walls, in illustration of what he meant as to there being no general system, 398, 399. —Does not think that the majority thoroughly committed themselves to the principle of groins, but rather staved the question off, 400.—By want of system, means a difference of opinion as to carrying out the improvement of the river by half-tide or full tide walls, 401.—Believes the Admiralty, when an Act of Parliament is passing for docks, generally get a clause inserted with power to fix the line, 402.—Believes that the line in the Hay Hole Dock case was settled according to the recommendation of their inspector, 403.—The Admiralty are responsible so far as that individual question is concerned, 404.—Is a notary public, and secretary to two or three insurance associations, 407.—Retired from the Commission last November, 408.—Was succeeded by Mr. Mather, 409. —Has no objection to the Admiralty settling the lines; thinks it is quite right, 410.—Has no objection to their settling the whole lines throughout the river, 411.—Adheres to the same opinions as were expressed in 1850, 412.—The Act was passed in 1850, and the first meeting of the Commission took place in November, 1850, 413.—A committee called the River Lines Committee has existed for the purpose of investigating the subject of the river lines since the 28th June, 1852, but had made no report at that time, 414–417.

LANCASHIRE SHORE:

Would be analogous to the Tyne if the south pier in the Tyne were extended indefinitely so as to catch the tidal flow, *Rendel*, 3970.

LAND:

Thinks the engineer stated on the 27th January and 8th of December, that it was his intention to make land along that shore, and that the corporation of Newcastle (when conservators of the river) had consented to make land along the south shore in order to indemnify Mr. Brown for injury done to his works, *Purdo*, 555.—Taken from the river, valued at 1,000 guineas per acre, *Linskill*, 990.—Formed from the deposit of ballast opposite the corporation estate; is worth, at a low estimate, about 30*l.* per acre per annum, *Stevenson*, 1248–1250.

LAND FLOODS:

During the entire duration of the tide, both ebb and flood, the water only fell six inches at Newcastle, *Brooks*, 2518.—The land floods affect the bar a great deal, but not always, 3044, 3045.—The land floods run very heavily into Shields Harbour, and sometimes send back the flood tide, *Harrison*, 3046, 3047.

LAND-MAKING:

Of the several sums put down under the head of dredging, river improvements, and ballast conveying, nearly half has gone for making solid land, *Stevenson*, 1280–1289.

LAND WATER:

In a river where there is very little land water it is the column of tidal water and the amount of that which is admitted each tide upon which its maintenance depends, though it is not merely a question of quantity, it is the velocity as well, *Stephenson*, 4115.—Looking at the quantity of tidal water that comes into the Tyne, the land water forms a very sensible portion of the whole, *ib.* 4164.—The quantity passing off at Newcastle is about 1,750,000,000 cubic yards, *Rendel*, 4280. —The supply on the Clyde is sometimes large, and sometimes is but small, *Walker*, 4453.—Comes down more rapidly in the Clyde than in the Tyne, *ib.* 4454.

LEVEL:

The low-water mark is lower at Newcastle bridge, a foot at Newcastle, and about nine inches at Bill Point, about four inches lower down, *Brooks*, 2585.—When the tide rises to 14 feet 11 inches at Shields, it rises to exactly the same level at Newcastle an hour and three minutes afterwards, *Calver*, 1801.

LEVELLING:

Mr. Giles' surveys were made entirely by levelling, with no reference whatever to the flow of the tide, *Murray*, 4693.

LETTER TO SIR JAMES GRAHAM, AND MEMORIAL:

Signed them, *Poppelwell*, 655.—At the time when that letter was written, the sanction of the Admiralty had been given to the piers, *ib.* 804.

LICENCES:

Objected to licences being granted to Messrs. Bowes and Company and Messrs. Palmer, *Purdo*, 513.—Respecting licence to be granted to Palmer and Brothers, Bowes and Company, Ellison and Leslie, for those encroachments, *Linskill*, 986–989.—Landowners must obtain a licence from the River Commissioners before they can receive ballast, *Stevenson*, 1458.—The only parties who have had a fresh license since 1850 are Messrs. Palmer, *ib.* 1459.—The conservators keep the original plans when they grant licences for encroachments, *Brooks*, 2260.—The Commissioners have granted no licences to enclose portions of the foreshores, *Clayton*, 3336.

LIFE COMMISSIONERS:

Were a sort of compromise, in lieu of the Admiralty Clause, with the opposers of the Bill, *Clayton*, 3504.—Mr. Cowen, Mr. Hunter, Captain Purdo, Mr. Stevenson, *ib.* 3506–3514.

LINES:

Thinks it right that they should be settled by the Admiralty, *Lamb*, 401.—Mr. Rennie's: The statement in Captain Washington's Report is correct, that the works "at times agreed with Mr. Rennie's line, at times went far within it, and at times far without it," *Linskill*, 919.—Are departed from at Walker, and going down that side of the river, *ib.* 1071–1074. —Witness's lines were always intended to be full-tide lines, *Brooks*, 2122–2127.—Nearly all the lines projected by witness show a cutting off of White Hill Point, *ib.*

LINSKILL, Captain WILLIAM. (*Analysis of his Evidence.*)—Resides at North Shields, in the Borough of Tynemouth; is the owner of property, and also a Justice of the Peace for the county, 902–904.—Resided at North Shields in the early part of his life, and constantly since 1846, 905.—Came back a short time before the agitation of the Shipowners' Committee commenced, 906.—Has taken a very active part in the proceedings with reference to the Tyne and the interests of Shields, and of the public, 907, 908.—Was chairman of the Committee for the promotion of the Conservancy Bill in 1848 and 1849, 909.—It consisted of about forty or fifty gentlemen of North or South Shields, 910.—The largest public meetings ever known to be held in those localities were held during that time, 1849 and 1850, 911.—Was the first Mayor of the Municipal Borough of Tynemouth in the year 1849, 912.—Was re-elected the second year, 913.—Became acquainted with the feelings of North Shields and Tynemouth from being called upon to preside at public meetings, 914.—The Bill of 1849 was lost for want of time, 915.—Attended inquiries before Captain Washington, and a Committee of the House of Commons, 916.—It was a matter of complaint that in the works executed, no uniform system of lines had been adopted, 917.—There was considerable evidence directed to that point, 918.—The statement in Captain Washington's Report is correct, that the works "at times agreed with Mr. Rennie's line, at times went far within it, and at times far without it, 919.—It was one of the defects of the preceding administration, 920.—Does not think it is cured by the new conservancy, 921.—Has never seen any lines brought before the Commissioners and approved of by them, 922.—Never saw any plans showing the quantities proposed to be dealt with, when questions have arisen about licences and grants of foreshore, 923.—Never saw any plans in the case of Palmer and Brothers, 924.—Never had any estimates of the works which have been executed, 925,—The Bill of 1849 passed the Commons substantially in the form in which the Shields Committee presented it, 926.—The Shields Committee were satisfied with that Bill, 927.—The Shields Committee re-introduced the Bill in 1850; both Bills contained powers to the Admiralty, or Commissioners

LINSKILL, CAPTAIN WILLIAM—*continued.*

named by the Admiralty, to control the local interests, 928–931.—Mr. Robinson was chairman of the South Shields Committee, 933.—Concurs in the sentiment contained in the paper introduced by Mr. Lamb yesterday, which was circulated at the time of the introduction of the Bill of 1850, 934–5.—It contains an abstract of the Bill as introduced by the Shields Committee in 1850, and the Bill introduced by the Corporation of Newcastle, 936.—States purposes of "The Tyne Conservancy (Shields) Bill, 937—The Corporation had no Bill before Parliament in the Session 1849, 938.—Their opposition was that the river was better, and that no alteration was required; their Bill was introduced in 1850, 939, 940.—There were large sums of money collected in North and South Shields by way of private subscriptions, in amounts varying from 200*l.* to half-a-crown, 941.—The bill was fought hard till it got to a Committee of the Commons, then the chairman asked the contracting parties to retire and come to terms, and the Shields people, as their funds were nearly exhausted, were obliged to accept the best terms they could get, 942.—There was never any compromise; it was left to the Committee, because the parties could not at all approach an agreement; it was fought before the Committee a considerable time, 943–945.—They thought that such a Commission would not work, 946.—There has been no material change in the management of the river since the new Commissioners came in, 947.—Thinks the Commission has been a complete failure. All the causes which led to the transfer of the conservancy exist still. The Commission is worked by means of committees, who conduct their proceedings very closely, and keep a very imperfect record of their proceedings, 948, 949.—In 1851 gave notice of a motion for a committee to watch and report upon the river works, when Mr. Philipson said it was unconstitutional and illegal, and wrong for the Commission to delegate its power to a committee, 950.—In spite of the objection, committees were subsequently appointed, 951.—The reports of these committees are brought up very suddenly, 952.—They take precedence of business of which there has been a notice of motion, 953.—Made a motion of the 28th of September last with reference to proceeding with piers; referred to a resolution of 4th May preceding, 954–956.—Does not think the matter was ever brought before the Commissioners from the 4th May to the 28th September, 957.—On 28th September introduced a motion to draw the attention of the Commissioners to the resolutions of the 4th May, and that the clerk of the Commissioners be instructed to write to Mr. Walker. Reads resolution, which was carried unanimously, 958–960.—Had it put in that shape, because the former resolution was communicated verbally, and Mr. Walker did not understand it, 961.—Complained in the Commission of the clerk having communicated such important resolutions verbally, 962.—Always understood that Mr. Walker was to have the entire management of the piers. Nothing was said about Mr. Brooks taking the superintendence of the piers prior to the 28th September, 963–965.—Thinks after that motions have been made that Mr. Brooks should assist in making the working drawings, 966.—There was a division upon it, because the Admiralty had allowed the piers to go on upon the understanding that Mr. Walker was to have the entire management, 967,—Excuses were made that Mr. Brooks was too much occupied to furnish a return which had been moved for and ordered, 968.—The general opinion was that Mr. Brooks had a great deal to do, and could not find time to attend to the piers properly, 969.—At a meeting of the Piers' Committee, Mr. Plews senior recommended Mr. Plews junior to assist in the working drawings,; he was sent for from a considerable distance; complains that that fact is not on record, or in any report furnished to the Commissioners, 970.—Mr. Clayton wrote the letter of 18th April, referred to in Mr. Walker's report of 15th November 1853, of his own accord, but the Commissioners afterwards confirmed it, 971, 972.—Prior to that communication does not recollect the matter ever having been brought before the body of the Commissioners, 973.—There has been considerable difference of opinion as to the position and size of the piers, 974.—The Admiralty only allowed a certain portion to go forward, which could be made by the funds provided by the Act, 975.—Has read the reports of Mr. Rennie and Mr. Rendel published by the Commissioners, 18th October 1851, 976.—In the plan advocated in the Commission, has generally been guided by the recommendations of Mr. Rennie and Mr. Rendel, 977.—Has approved of

LINSKILL, CAPTAIN WILLIAM—*continued.*

the principle of half-tide training walls, 978.—Has concurred in the motions made adopting that system, 979.—Entirely concurs in the opinion expressed by Mr. Straker yesterday, 980, 981.—Approves of carrying out ballast, by what is called the hopper system, to the sea, 983.—Thinks it would be judicious to keep the reserve at the back of the half-tide walls, as a place of deposit for foreign ballast, the season being such that it could not be taken out to sea, 984, 985.—Was not present at all the discussions which took place with regard to the licences to Palmer and Brother, Bowes and Co., and Ellison and Leslie, 986.—The Commissioners never had any proper information as to the quantity of land to be taken, 987.—Was asked by Mr. Macartney, the Member for Antrim, how it was that Mr. Wilson, the Secretary for the Treasury, could have been so misled as to inform him that the accommodation granted at that particular part of the river was merely of a temporary character, 988.—Is not aware of the terms of any licences having been actually settled, 989.—The land taken from the river was estimated by Mr. Poppelwell, a Lloyd's surveyor, at 1,000 guineas per acre, 990.—Was not present when Mr. Philipson came there as representative of the landowners, 991.—Thinks there should be the strongest possible Government control, 992.—The influence at Newcastle is immense, 993.—Does not think that gentlemen engaged in trade, either at Newcastle or North Shields, can act properly for the river without independent control at head quarters, 994.—Remembers motions having been made by Mr. Rayne and Mr. Allhusen, pointing to the course of action which witness and those who acted with him approved, 995.—Thinks the motions were withdrawn, 996.—Has no interest in the matter except as an owner of property living at Shields, 997.—When the Shipping Dues Commissioners held their inquiry at the mouth of the Tyne, in the town hall of North Shields, the Mayor entreated them to recommend the Admiralty to take the entire charge of the River Tyne; the proposal was received with cheers from a crowded town hall, 998.—Thinks a large majority of the people would be delighted to see the Tyne handed over to an independent body either like that at Liverpool, or appointed by the Admiralty, and responsible to Parliament, 999.—Believes it has been found to work well in Liverpool, 1000.—Knows no work which has been since undertaken; is not an engineer, 1001.—Has read all the reports issued by the Admiralty inspectors, and especially the Admiralty report of Captain Calver, 1002.—Thinks Mr. Rendel's report ought to be acted upon at the present time, 1003.—Does not see any estimate for half-tide walls, excepting in Shields Harbour and Jarrow Slake, in Mr. Rennie's report or estimate, 1004, 1005.—Has never heard what Mr. Brooks' river lines were; does not remember a large general plan, 1006, 1007.—The only plans witness ever saw were those printed and lithographed in 1851, at the same time as Mr. Rendel's; has them in his possession yet, they have lines on them certainly, 1008–1010.—Read a report of Mr. Brooks to the chairman of the River Committee, furnished in the year 1843, 1011.—Believes Mr. Brooks was appointed in 1842, 1012, 1013.—Recollects the passage in the report referred to, but never saw the working plans, 1014.—Recollects reading the following passage in the report: "It appears that when the late "Mr. Rennie was called upon to give his views for "the improvement of the Tyne, its banks were not at "that time so much covered with manufactories, "commercial establishments, and coal staiths, as we "find them at the present day, and it was probably "owing to that cause that we find on several portions "of his plan evidence of his opinion that the esta-"blishments which existed were not of sufficient im-"portance to cause him to resolve in his mind whether "the removal of the shoals could not be effected by a "different disposition or arrangement of the works to "form the improved sailing course?" 1015.—Has a plan furnished with that report, but does not think it would be considered a proper working plan, 1016.—Does not know if that report is in the appendix to the report of the Tidal Harbour Commissioners, 1017.—When the second Bill was before the House of Commons, Sir John Yarde Buller advised them to come to terms, 1018.—Accepted the recommendation with regard to the general principles of the Bill, but not as to the form of the Commission, 1019.—They were obliged to accept the terms, because the funds were exhausted; the subscriptions were private ones; they were fighting against a public purse, 1020.—The constitution of the

LINSKILL, CAPTAIN WILLIAM—*continued.*

Commission was arranged by a Committee of the House of Commons, 1021.—Does not consider the committees by which the Commission is worked are open, because there is very often no report of their proceedings at all, but when there is it is very meagre, and contains only a faint outline of what takes place, 1022.—A meeting of the Commission has latterly been commenced by reading the minutes of proceedings of the committee, 1023.—Has not attended many committees; has once or twice been insulted there, 1024, 1025.—Thinks there were more than twelve against them on the motion of Mr. Brooks assisting Mr. Walker, 1026, 1027.—The division was carried by a majority of twelve to three, 1028.—Mr. Poppelwell, Mr. Mather, of South Shields, and Mr. Robinson, of Shields, were in the majority in that division, 1029–1032.—The object in dividing the meeting was that the majority recommended a departure from the original arrangement with the Admiralty, who have since stopped the piers on those very grounds, 1032.—Never saw any plan with reference to the proposed licence to be granted to Mr. Leslie, 1033.—Was not present at the meeting on the 19th December 1853; was not a regular attendant, 1034, 1035.—Was aware Mr. Brooks had proposed lines, 1036.—It was part of the contest that the works were not carried on according to Mr. Rennie's lines, or according to Mr. Brooks' lines. Mr. Nicholson gave it as his evidence, that for the works in Shields Harbour, Mr. Brooks proposed six different sets of river lines in three years, 1037–1040.—During the discussions, there have been a great number of different lines proposed by Mr. Brooks from time to time, 1041.—Witness's appointment on the Piers Committee was objected to by Mr. Philipson, 1042–1045.—Understands Mr. Rennie to have adopted the principle of half-tide training walls generally in his report, 1046–1049.—Nothing was ever done by the body of the Commissioners on Mr. Rendel's report, 1050.—Made a motion that 200 more copies of Mr. Rendel's report should be printed, but it was rejected, 1051, 1052.—Understands the constitution of the Mersey conservancy, and approves of the system, 1053, 1054.—Recollects the evidence by Mr. Nicholson before the House of Commons in 1849, 1055.—There was a clause introduced in the House of Lords without witness's knowledge or consent, 1056.—Clause 53 an indemnity clause, 1057.—Thinks resolutions have been passed about the foreshore in the Tyne Commission without plans, 1058.—In Messrs. Palmer's case a resolution was passed, granting a licence, without a plan being produced, 1059–1062.—Witness was present and recollects it perfectly, 1063, 1064.—Does not recollect any other case, 1065.—Does not recollect the precise terms of the resolution passed requesting Messrs. Palmer to furnish a plan of their application; cannot say for certain whether he was present or not 1066–1069.—Is certain resolutions were passed with, reference to Messrs. Palmer's application when no plans were produced, 1070.—Captain Washington refers to Walker as an example of works executed not according to Mr. Brooks' lines, 1071.—Commencing at Walker, and going down that side of the river, thinks it will be found that Rennie's lines are departed from, 1072.—Cannot point out the particular spot to the satisfaction of the Commissioners, 1073, 1074.—Thinks the plan produced by Mr. Brooks is similar to one in witness's possession, 1076.—Does not recollect ever having seen it referred to by the conservancy in their proceedings, 1077.

LONGITUDINAL SECTIONS:

Without transverse sections would not show the tidal capacity of the river, *Brooks*, 2218.

LOW LIGHTHOUSE:

Is under the control of the Trinity House, *Wake*, 3907.

LOW WATER:

At Newcastle it will be found that the low-water surface is about a foot lower than the old state of the river, *Brooks*, 4829.

LOW-WATER LEVEL:

Every irregularity, whether on the side of the river in plan, or at the bottom of the river in section, affects the outfall of the water, and raises the level of low water at any point of the river. Thinks it very important to lower the low water, as it lessens the resistance which the ebb makes to the flood in coming in, *Stephenson*, 4108.

LOW-WATER SURFACE:

The result to be obtained is the depression of the low-water surface, and the raising of the high-water surface, *Stephenson*, 4215.

LYNN:

Made an investigation of the tides, and found that the ebb tide was not so low as the ebb four miles below in the wash by four feet six inches, and that the flood was not so high by some inches, *Rendel*, 4378.

MACCARTNEY, GEORGE, Esq., M.P. (*Analysis of his Evidence.*)—Has directed his attention for some time to the state of things in the Tyne, 4408.—Was chairman of the Tynemouth Dock in 1852, 4409.—In consequence of a communication from the Shipowners' Society, or some public body at North Shields, witness was requested to put a question as to the encroachments by Messrs. Palmer, in consequence of a grant from the Commissioners of the Tyne. Witness put the question to Mr. Wilson, who said it was only "for a temporary purpose," 4410–4413.—Examined the river with the old and new charts subsequently to this question being put, 4411.—Mr. Wilson's answer to that question put in the House of Commons was that the encroachment was "for a temporary purpose," 4412.—Remembers the Tynemouth Dock being opposed by the Commissioners, both before the Admiralty surveyor, Mr. Hawkshaw, and in Parliament, 4414, 4415.—Satisfied himself, when he was made chairman, that that dock and plan by Messrs. Locke and Errington were upon the principles laid down in 1845 by Mr. Brooks, 4416.—Did not anticipate opposition from Mr. Brooks, or at his instance. The greatest opposition was from the Ordnance. Finding that, witness had a communication with the Inspector-General of Fortifications, and in consequence of his recommendation, went down to Shields and met Captain Moody, who had first suggested its interference with Ordnance property, 4417.—Witness after that received an assurance from the Ordnance that the arrangement was satisfactory, and that they should go on, 4418.—Has seen it in print that the Commissioners authorized this opposition, and that some of their funds were applied to it, 4420.—Saw a copy of a resolution of the Commissioners to that effect, but cannot say whether it was a correct one, 4421, 4422.—Until the question of the piers at the mouth of the river was definitely settled, it was one of the grounds for preventing their going on, 4423.—Did not know at that time of the correspondence which was going on between Mr. Walker, Mr. Brooks, and Mr. Clayton with reference to the piers, 4424.—It was in April 1853, 4425.—So that when the opposition took place in Parliament witness did not know what was the state of the question as regards the piers or the correspondence, 4426, 4427.—An application has been made to the House of Commons upon witness's motion for the production of the correspondence since a certain date, 4428.—Thinks it material to the interests of the Tyne, and to affording information before this Commission, that the correspondence with reference to those piers should be before them, 4429.—Has seen a print of part of the correspondence by Mr. Walker, 4431.—Has a copy of the motion which witness made, and the same altered at the Admiralty and granted as an unopposed motion. Produces the one he put on the paper on the Thursday, and the one he adopted, 4432.

MARGIN:

About half way down to the half-tide wall, which had been commenced in front of the place, *Stevenson*, 1107–1117.

MATHER, JAMES, Esq.—(*Analysis of his Evidence.*)—Is a Commisioner for South Shields, 3763.—Remembers the Tyne upwards of 30 years, 3764.—Previously to the establishment of railways between Newcastle and Shields, the best means of conveyance were the steam-boats upon the river. At that time witness had frequent occasion to visit Newcastle, and often was left upon the shoals of the Tyne; first at Jarrow, then again at St. Peter's for two or three hours, waiting for the tide, 3765.—That would be about the year 1830 or 1831, or 1832, 3766.—It was then much worse than

MATHER, JAMES—*continued.*

now, 3767.—The depth of water over those shoals at that time could not have been more than about three feet or so. Small packets were used, now there are large steam-packets for towing, passing up and down the river at all times of tide, and witness never hears of such occurrences as those just named, 3768.—From the effects produced, should say the Commission must have worked efficiently. The tonnage of this port has increased in size to a large extent. Does not mean the mere amount of tonnage, but the size of each particular vessel and the average of the whole, notwithstanding some engineering opinions, and the numerous and perplexing opinions given by pseudo and amateur engineers. This practical development of the Tyne is demonstrated by the daily expressed opinions of shipping men from all parts of the world, and shipowners along the whole coast. Will put in some statistics condensed from the Parliamentary records of the state of the Tyne in 1844 and at the present time, in reference to this point, 3769.—Gives the documents, the shipping returns, 3770.—Considering the obstructions, sand banks and others, in the Tyne, seeing that nearly a million of money has been concentrated to improve the lower portions of the river and facilitate the navigation, looking at the piers, the docks upon the Slake, and the Northumberland docks, which are supported or promoted by the Tyne Commission, feels that as far as they are personally interested at South Shields, the Commission has worked exceedingly well. There are two other things of great importance here. The removal of Newcastle Bridge is admitted in every direction to be an important feature in the engineering of the Tyne. Every member of the Commission thinks it desirable to have it removed at the earliest possible time, more particularly the Commissioners at the west end of the river, who are largely interested in deep water above Newcastle, and a perfect scouring power downwards to the bar. Unfortunately the Commission here differed upon a financial question. Instead of Newcastle or the western localities being perfectly overpowering, and carrying what they sought to accomplish, the minority, of which witness was one, defeated them, or placed them in so narrow a majority, that the question was not presentable before Parliament, because the financial scheme before the Commission was not at all satisfactory, and would have encroached too much upon the general fund of the river, 3771.—It would have been done could they have afforded it, 3772.—Trusts arrangements will be made by next session to accomplish that most important object on the Tyne. Since witness entered the Commission, they have done nothing but labour at the piers without producing any results. It is not the fault of the Commission, but of parties over whom they have no control, and who have no control over them. It is not the mere work of navigation, or of a deep entrance over the bar, but a question of thousands of mens lives which are at stake; therefore is astonished at the obstructions they encounter in their progress. All their plans are ready, and trusts that the Commission here will favour the proper object of the Tyne Commissioners, and facilitate the removal of such obstructions as may lie in the way of that important work. The document witness wishes to submit is, the average number of wrecks, 3773.—This is a more extended account than was sent to the Chancellor of the Exchequer and to the Admiralty. It not only applies to the short radius of 30 miles from the Tyne, but extends for 100 miles; and this is a question which, as soon as these piers are completed, will touch every portion of the north-east coast, about which one of the members of the Royal Commission made an examination, 3774, 3775.—Would allow the present Commission to continue. A minority must always continue a minority if it chooses to be so, and the works of the Tyne must be continued according to the judgment and upon the responsibility of the majority. Objects to the interference of any external party, such as the Admiralty, in a matter of this kind. Should certainly object to spend his money and that of his constituents in the lower part of the river for anything but general commercial purposes. Suggests that it might be advantageous that there should be some scientific Board in London, to whom all vexed questions might be referred by the important rivers of this kingdom, or for reference on matters of disputed engineering, 3776.—Not to take in hand these vexed questions, but to be referred to for their opinion, 3777.—As a Board of Appeal for advice, not for decision, 3778.—Regards the town of South Shields and its district as his constituents, 3779.—Is not in the habit

MATHER, JAMES—*continued.*

of haranguing them, 3780.—Is a wine and spirit merchant, and was formerly a shipowner also, 3781, 3782.—Is the youngest Commissioner; has been born only three months, 3783.—Cares little about having the other nine out; the pleasures of life are very few, 3784.—Thinks the obstructions as to the piers rests with the Admiralty, 3785, 3786.—On this subject has always thought so, 3787.—Does not remember making a speech at South Shields on the 9th of January 1850, 3788.—There are to be in the Commission two Admiralty Commissioners, 3789, 3790.—Understands so; they are to be appointed by the Admiralty, 3791. When a vacancy occurs, 3792.—Witness expressed his own opinion at a public meeting that the constitution of the conservancy of the Tyne should be changed, 3793.—Does not remember making complaints against the old conservators, that inasmuch as the ships had increased in size, they had done nothing to give accommodation in Shields harbour. Thinks it impossible, 3794.—It is a fact that they are doing enormous things there at present, 3795.—The piers and docks, 3796.—Believes he did write a letter from the banks of the Tyne, addressed to the chairman and members of the River Committee, signed "A Civil Engineer." Should like to see the letter. Thinks some of these gentlemen around once brought it to his remembrance, 3797–3801.—It was witness's opinion, and is so still: "Full room "for the tide in your river for the supply of water "from the sea below, and not from the interior above, "for which purpose deepen every part of its bed, if "possible, to high-water mark," 3802.—Though differing from the present engineer of the river with regard to jetties, coincides in his half-tide walls; and in fact, generally with the minority, as far as engineering is concerned, 3803.—There is no difference of opinion at South Shields as to the policy of Mr. Brooks's plan of cutting off White Hill Point. They decidedly object to it, for this reason, instead of making th eriver more direct, it would give it a more acute angle at Hay Hole Point. The angle would then be only about 112 degrees from Hay Hole Point to the two reaches of the river; as it now stands it is about 135. It is said to be objectionable, because it stands a little prominently from the shore; but it gives the river a more obtuse angle and more direct force, 3804.—Did not send out that letter from which an extract has just been read, but every word of it is true, and witness employed a barrister upon the matter, 3805.—Not Mr. Webster, it was Mr. Cayley.

MEDWAY:

Is an immense river; i carries line of battle ships up it, *Purdo*, 640.—The supply of fresh water coming down is very small, *ib.* 641.—There is a good deal of land water coming down the Medway sometimes, *ib.* 642.

MEAN TIDE WATER LEVEL:

Is much wanted, *Brooks*, 2747.

MEMORIAL OF THE 3D OF AUGUST:

Concurred in the statements which were contained there, *Lamb*, 397.

MIDDLE GROUND:

Mr. Brooks' line goes beyond Mr. Rennie's, with the object of acting more effectively upon the Middle Ground and the Insand, *Brooks*, 2326.

MINORITY:

Is principally composed of the parties who promoted the Tyne Conservancy. They generally approve of training half-tide walls, *Robinson*, 3814.

MOORING FUND:

Nearly all laid out in Shields Harbour, *Stevenson*, 1478.—Was a tax at the disposal of the Commissioners, *ib.* 1480.—The commission have a mooring fund, which provides, by a separate tax upon shipping, for putting down moorings. The amount is about 800*l.* to 2,000*l.* a year. It is a farthing a ton upon shipping; one third goes to the police, and two thirds to the mooring fund, *Cowen*, 3615.

MOORING OF SHIPS:

In Shields Harbour, produces a considerable amount of stream and scour, *Rendel*, 3964.

Moorings:

A public notice given with regard to them in the channel north of the Cockcrow Sand, *Stevenson*, 1317.

Muckhouse:

A large mass of sand existed abreast of Muckhouse, *Brooks*, 1983.

Municipal Borough:

Tynemouth became one in 1849, *Linskill*, 912.

Murray, John, Esq.—(*Analysis of his Evidence.*)—Is at present the engineer of the Sunderland Dock Company, previously had been engineer to the Commissioners of the river Wear and Harbour of Sunderland, 4577.—Has a general knowledge of the river Tyne since the year 1832, 4578, 4579.—At that time the Corporation of Newcastle were the conservators of the river, and witness was employed professionally by them, 4580–4582.—Has kept up his knowledge of the Tyne down to the present time very generally, 4583.—Witness states that when he was first acquainted with the Tyne it was full of sand-banks, and he has been frequently aground upon those sand-banks in steamboats, which has not been the case latterly, 4584.—Considers that an improvement has taken place in the Tyne at present as compared with the year 1832, 4585.—Is not sufficiently acquainted with the river Tyne to enter into details. Did not come prepared with any evidence at all upon the subject of the river Tyne, 4586.—Has been frequently going up and down the Tyne himself, and it is upon that general knowledge, without an examination of charts or soundings, that witness's opinion is formed, 4587.—The river has improved as a navigable river, 4588.—Has seen Mr. Walker's and Mr. Rendel's plans which have been in contemplation for the building of piers at the entrance to the river, 4589.—Being very much interested in the subject of the improvement of the Tyne, as well as other rivers along the coast, being resident at Sunderland, has taken various opportunities to inspect the coast, and has been professionally employed in a great number of the harbours along that coast. The mouth of the Tyne is one of those which he has often studied, the effects of the tides, and the means of improving its mouth by the erection of piers, 4590.—Has made sketches or plans of the piers he would there propose, but simply as an amateur, or for his own information, 4591.—Witness here gives the Commissioners his own views upon the subject of these piers; has sketched his views out upon a plan (produces the same), 4592.—Witness has not thought it necessary to prolong the piers to the extent proposed by Mr. Walker, which would give a longer run into the harbour. That longer run into the harbour would be, of course, beneficial, and throw the bar further out into deeper water; but it is attended with a large cost, 4593.—The piers proposed by witness, seeing they do not go into deep water, as projected by Mr. Walker, of course would be attended with less cost, 4594.—Has been acquainted with Sunderland since the year 1832, 4595.—The northern pier was extended by witness for a considerable distance beyond the old pier; the old pier was rooted out, and a portion of it was re-faced, 4596.—Formerly the old pier did not extend so far as the south pier. Has plans of Sunderland Harbour, which probably the Commissioners would like to look at, inasmuch as they give a very curious history of what has been effected in Sunderland Harbour from the period when it had no piers at all until the present. (Witness produced the same.) The series of plans which witness now produces to the Commissioners accompanied a report or a paper which he gave to the Institution of Civil Engineers, some years ago, and which are in their minutes. These are copies of the plans deposited with that paper. The first of them, which is in 1719, is a plan of the mouth of Sunderland Harbour previously to any piers being erected. The second is a plan of the mouth of the river Wear between 1737 and 1757, when the south pier had been projected to a certain distance, pointing in a north-easterly direction. Mr. Labelye, the engineer of Westminster Bridge, was consulted by the Commissioners of the river, and he recommended a north pier to be erected for the purpose of sheltering the harbour, and a very voluminous report was made by him upon the subject. The north pier was not executed, as he, in his own report, threw some doubts upon the subject whether it would not have to be taken up again if it did not answer the purpose, 4597.—That was some time after the

Murray, John—*continued.*

south pier had been executed; that had been executed alone. In the year 1737 there was a survey made under the authority of the Commissioners of the river to the extent of the tidal flow, and upon that survey there are certain soundings given which witness has laid down on a longitudinal section of the river, which he will produce presently for the purposes of comparison with what it was in the year 1842. No. 3 is a plan in the years 1779 and 1780, when Mr. Smeaton, the celebrated engineer, was called in by the Commissioners to give his opinion upon the extension of the south pier. (Witness here enters into particulars.) No. 4 is a plan of the mouth of the river Wear, showing the commencement of the north pier in 1786, and its termination in 1797, and the extension of the south pier. (Enters into particulars.) Plan No. 5 gives the state of the piers between 1804 and 1807, with their proposed extension by William Jessop. Plan No. 6 shows the state of the piers in 1819, when the late Mr. Rennie was called in by the Commissioners to give his opinion upon what should be done with regard to the mouth; Mr. Rennie's lines are denoted in red ink upon this plan, 4598.—A portion of the south pier has been executed as far as the extremity of the old pier; the north pier has been executed, not exactly on those lines, but something very similar to those, without the projecting spurs. The plan No. 7 shows the state of the mouth as it was in the year 1846. Witness's predecessor had executed the south pier. Witness did the north pier, and cut off some portion of the angle of the pier. At an after period he threw back the south pier into the form of a beaching basin, something similar to the Potato Garth, for the purpose of preventing the inrun of sea, 4599.—It has had the desired effect, as tested in 1846. Witness gives the details, 4600.—The works of the Commissioners have been dredging the river, running out the lines of piers, and confining the current at its mouth, taking off a great number of bends, and rooting up rocks in the bed of the river, 4601.—The whole of the works are in the lower part of the stream. The effect in 1737 was, with only one pier, that the water striking that south pier alone was thrown up further into the country by 5 feet 3 than it is at the present day. In the year 1737 there was only one pier, and that happens to be the very year in which this chart was made by Burleigh and Thompson, and which witness has delineated on the longitudinal section now before the Commissioners. That shows that the tide, deducting the two feet for the rise of tide above the datum level of the present day, attained a higher level by 5 feet 3 than it does at the present time, 4602.—And the bed of the river is so much deeper. Assigns as the reason in his paper that the water striking the pier a momentum was given to it, and it was thus carried further up the country, 4603.—States further in proof, that in the year 1832 the north pier from the lighthouse eastward was an open timber framing, solid to a certain height. The extremity of the south pier was then a solid pier. A few years previously to that, in the year 1819, Mr. Giles had taken very accurate observations of the height of the tides all the way up the river, and his observations led him to this conclusion, that the high-water mark of ordinary spring tides attained a level throughout the river as far as it flowed, 4604.—Believes his observations proved that it was nearly a level line between the bar and Biddick, nine miles from its mouth. In making other observations of his own, in the year 1843, witness had reference to the same gauges which Mr. Giles had placed in the river, and compared it with a great number of tides, and found that it had attained somewhat about 8 inches higher than the level line in the year 1819. Since 1842 the present engineer of the Commissioners has told witness that it was something about the same, 4605.—Imagines that the momentum given to the water is in consequence of the improvements which have been effected by the River Commissioners in dredging the interior of the harbour, removing a great number of shoals which had existed, and increasing the sectional area to allow a free passage for the water up the stream, 4606.—Has stated that the solid form of the south pier beyond the north pier, and the north pier being hollow, caused the tidal wave to strike the south pier, and to run up rapidly, and was about to prove that by the evidence, that in 1819 it ran up to a certain height, and that in 1842 it ran up to a greater height; but it proceeds from the internal improvements of the river, rather than from the altered form of the piers, 4607.—During those periods the south pier had been

MURRAY, JOHN—*continued.*

built solid, 4608.—Since 1832 the north pier has been made solid, 4609.—And it would project to a small extent beyond the south pier, 4610.—During the time between 1819 and 1842 a great deal of other work was done in the shape of dredging, 4612.—In 1737 the tide went to Newbridge, 4613.—At that time the tide ran up much higher than it does now, 4614.—Then there was only the south pier existing, 4615.—In 1737, from the sections the tide rose higher at Biddick Ford than it does now, 4 feet 3, 4616, 4617.—At that time the mouth of the river was somewhat of a trumpet shape, and pointed northwards; the river was very much obstructed from the shoal ground which existed in the bed of the river; it impeded its running up, 4618, 4619.—By this chart it would appear that the relative position of the lateral shore and of the pier formed a trumpet-shaped mouth, which would receive the tidal current, 4620,—Had occasion to contour the whole area of the North Sea, for the purpose of a paper which he communicated to the Royal Society. Had also sets of observations made while in Sunderland in the year 1838, of the height of the tide in Shields Harbour, at Sunderland and at Hartlepool. The result was that witness found the tide rose higher at Hartlepool about a foot or 18 inches than at Sunderland. Imagines that was caused by the projecting headland of the Yorkshire coast, 4621–4624.—Since 1832 up to the present time there have been considerable changes in the relative position of the Sunderland piers, 4625.—In 1832 the south projected as a solid pier, and a portion of the north pier was open, 4626.—And the set of the tide and the set of the swell came through the north pier, 4627.—When witness made the north pier solid he thought the bar was more stationary and deep, not entirely from the solidity of the north pier, but more from the improvements, 4628.—Since then the north pier has been carried out a good deal further; it projects beyond the south pier now. It was solid to a certain height, and open above. Believes this plan has the sections of 1819 and 1832 put side by side, 4630–4632.—As far as the scour of the river is concerned, and as far as the bar is concerned, judging from Sunderland, does not see any reason why at Tynemouth the piers should not be carried out each to about the same distance north and south, 4634.—Does not think, with respect to obtaining the set of the tidal current against the southern pier, and sending it up the river, it would be worth carrying out the southern pier to any great extent further than the northern, 4635.—There is no record of what the bottom of the river was in former years, except between Newbridge and Biddick Ford, and between Hylton Ferry and the bar, 4636.—There is a gap between Hilton Ferry and Biddick Ford which has no soundings, for what reason witness cannot tell, but those he has connected together by levelling, 4637.—The depth of water in 1737 at Biddick Ford, at the same high water as the one under consideration at present, was 7 feet, 4638.—It is now 5 feet, 4639.—Thinks the documentary is the most important evidence to the fact that the tides formerly rose higher at Biddick Ford than they do now, 4640.—It is well known that keels used to take in their cargoes of coals at Pictory, two and a half miles above the present tidal flow, and navigate the river from thence downwards. No navigation can now be carried above Biddick Ford, 4641.—The soundings taken in 1737 extend over a length of river two and a half miles in extent; combining the whole soundings, and laying them down on paper will give the general variation. Thinks it would be erroneous to judge from any particular spot; but taking it over an extent of some two and a half miles, there could be nothing very erroneous in the deductions formed from such a basis, 4642.—Gets the level of high water at Biddick Ford in 1737 from the table given on the plan. Of course it greatly depends upon the accuracy of this statement, 4643.—At Biddick Ford there is a rise and fall of 5 feet, 4644.—Has made this section from the whole combined, 4645,—There was a rise and fall on that day of 16 feet 6 at the bar, and there was a rise and fall of 5 feet at Biddich Ford, and there are some other figures; the two are combined. There are levels besides in another table at different places all the way up the river, 4646,—The chief navigation of Sunderland is done by steam tugs, which take the vessels in and out of the harbour. In bad weather it depends upon the wind; if there be a strong northerly gale they keep close to the north pier, and get immediately under its lee, 4647.—When vessels are entering Sunderland in a north-easterly gale, if the tide has a

MURRAY, JOHN—*continued.*

very strong set at that period when they enter, they sometimes are thrown too far to the south, and are thrown outside the pier, and sometimes close inside, rarely against the pier; there are instances where they have struck against the pier, 4648–4650.—Thinks the south pier at Sunderland being made parallel to the north rather renders a facility to ships entering that harbour than otherwise; the current carries them forward; it is between half-flood and high-water, 4651.—Would rather both piers had been parallel than the sort of trumpet mouth which is given to the pier. At the southern outlet of the Sunderland Docks, which witness is now constructing, the piers are thrown back in a totally different direction, but that is for the dispersion of the waves in such an exposed outlet, 4652.—With respect to parallel piers witness has stated that he found a very extraordinary advantage in the diminution and almost destruction of waves by a sudden enlargement just within the north and south pier, 4653.—There is no parallelism in the piers as designed by Mr. Walker, and there is no bulging out on each side as at Sunderland, 4654.—For the purpose of dispersing the waves, would open those piers, as witness is doing at the southern outlet, 4655.—As regards the form of the piers as proposed by Mr. Walker at Tyne mouth, that effect of the dispersion of the wave would be produced in an effective manner, but you get rid of the advantages of the parallelism, 4656, 4657.—As far as the wave is concerned, parallelism cannot be of any advantage, 4658.—Sees great advantage in throwing the pier backwards in a curved form, both north and south, for the purpose of getting rid of that wave which had been generated between the parallelism of the piers. Believes that if the pier had been made circular altogether, the entering wave could have been forced to meet the outward wave, and have formed a sand-bank between them, 4659.—The wave traverses round a curve easier than round a sharp corner, 4660.—Witness produces a plan showing an outlet of the Sunderland Docks now in course of construction, where the north pier is solid with a curved head, level with high water, for the purpose of allowing heavy waves to fall over it and kill the entering wave thrown in by a south-easterly gale, which has a tendency to hug the pier, 4661.—This is now constructed as far as the head. The southern breakwater pier is done with timber, solid to a certain height; the waves penetrate through it, but it is designed to be an isolated pier, so that the wave which penetrates on the left hand will have a tendency to hug the pier and be thrown against the external wave, and meeting, it will form a sand-bank between the pier and the embankment, making a large expanding tidal harbour for the waves to fall into, 4662.—Has had a great deal of experience at Sunderland in dredging; dredged in the year between 100,000 and 150,000 tons; it is done by steam dredgers, put into hopper vessels and towed out to sea by steamers; little or none is put ashore, 4663–4666.—The average cost per ton is 4*d.*, for raising and depositing at sea the expense was about 1½*d.*, the fuel was little better than one tenth of a penny, the labour in repairs about 1*d.*, and the materials for those repairs about 1¼*d.*; that was the result of five years' work, and the total quantity raised in those five years varied between 90,000 and 141,000 tons, 4667.—Witness knows that these accounts are correct, 4668.—There is no interest on capital there. Two machines are employed. The capital embarked in that witness has valued at 12,000*l.* Believes the Commissioners have engaged a larger number of hoppers and dredding machines than when witness was there, 4669.—15 per cent. upon the 12,000*l.* would be 1,800*l.*, that would be another 2½*d.*, and would make it 6*d.* or rather more per ton; there would be no profits on that, 4670–4672.—They take the ballast a little farther out to sea than was done at that time, but that amounts to very little, 4673.—The effect of dredging a mile or two up the river would be very trifling; if the vessel could go to sea the same tide it would not make any difference at all, 4674–4676.—The distance is much greater on the Tyne; is afraid they could not go to sea and back again to the higher part of the river in one tide, 4677, 4678.—Does not think they could go from Hebburn Quay in one tide. At Sunderland the whole dredging operations are confined to about a mile or a mile and a half above the pier heads; little or no dredging is done above that; there is therefore every facility for their going out early on the flood tide, and returning again before the ebb; but if you made the distance from where the dredging machines were at work to the

MURRAY, JOHN—*continued*

place of deposit very great, of course they could not accomplish it in one tide, and there would be the detention of the vessels during another tide, it would therefore require probably more hopper vessels to keep the work going, 4679.—It would affect the expense of taking to sea and depositing at sea. Depositing at sea is a very small item of the expense; it would require more hopper vessels; that would be the principle thing, 4680, 4681.—The distance to sea would have very little effect on the total cost, excepting in the detention of vessels, and obtaining others to make up for lost time, 4682, 4683.—There would be an increased number of hopper vessels, and therefore an increased amount of capital in hoppers, but no more dredging machines, 4684.—Ballast from ships could be put into hopper vessels and taken to sea at as low a rate as the dredged ballast. At Sunderland a considerable quantity is taken to sea by private individuals in hopper vessels; the Sunderland Dock Company do so likewise to some extent, 4685–4687.—If it could be taken out of the vessels and sent to sea, the cost would not be much higher than the dredging and sending to sea. There is the getting it out of the vessel, 4688, 4689.—Dredging is carried on in Sunderland from eight to nine months in the year. The rest of the year the hoppers are laid up, and during that interval the dredging machines are repaired, and substantial repairs which are wanted are done; it would be done more cheaply if kept on the whole year, 4690–4692.—Mr. Giles' surveys were made entirely by levelling, and with no reference whatever to the flow of the tide. Mr. Giles, by taking levels, started with a fixed tide, and put up gauges along the river in various places up to Biddick Ford, by levelling, 4693. —By spirit level, by instrument, 4694.—Believes Mr. Giles' deduction is, that the datum horizontal line, which extends throughout the whole length of the river for upwards of nine miles, coincides exactly with the high water of ordinary spring tides, 4695.—The second horizontal line is simply a line drawn 14 feet 6 below the other datum horizontal line, which is high water of ordinary spring tides, 14 feet 6 on the tide gauge of the north pier. Mr. Giles by these gauges, which he had erected in various places up the river, by means of levelling throughout, ascertained that in an ordinary spring tide it attained a level line from the bar to the extremity of its flow; and Mr. Rennie quotes that as the datum in the whole of his calculations on the quantity of tidal water admitted into the river on that basis. The low-water line at neaps and springs is laid down on the section, and they are not by any means a horizontal line, 4696, 4697.—He refers all his measurements here to the horizon of the bar, 4698.—Witness thinks there is a misunderstanding in assuming the words "the bar" for the datum at which they start; it is not the bar itself, it is the water at the bar. It will be observed that the table says, the flowing of the tide compared with the bar at the bar; then this other part says, that it is a level line, taken out as the horizon of the bar, namely, low water of spring tides of that day, 4699–4701. —To disperse the waves, piers, such as those proposed by Mr. Walker, or a cone with a narrow orifice and a large base would be the best, 4702.—To conduct the water so as to preserve the momentum, the piers must be more or less parallel, 4703.—Is of opinion that the Yorkshire Headland leads to an elevation of water at Hartlepool, 4703.—The projecting headland of Yorkshire is nearly at right angles to the direction of the flood, several miles south of Hartlepool, 4705, 4706.—That headland causes a recoil or heaping up of the waters, 4707, 4708.—At Tynemouth the projecting headland is to the north of the entrance; at Hartlepool it is exactly on the opposite side, 4709, 4710.—If the headland at the mouth of the Tyne were removed, and there were projecting land on the southern side of the harbour, the tide would be heaped into the Tyne more than at present, 4711.—This state of things would to a certain extent be obtained by a south pier, 4712.—Thinks the entrance of water into an estuary like the Tyne is more a question of momentum than statical pressure, 4713.—And therefore the extent of the trumpet mouth, and the position of the pier which shall catch the flood-tide, is of essential importance, 4714.—The entrance of water into an estuary situated as sketched in this diagram, as regards the headlands and piers and flood-tide, would be essentially different, 4715, 4716.—Witness living at Sunderland, his attention would be directed to piers at the mouth of the Tyne, as an engineering question, 4717.—In the plan

MURRAY, JOHN—*continued.*

witness referred to, the black line shows the sort of piers which he would recommend for the Tyne, 4718.—The bar would be outside them. Thinks that whatever piers are put at the mouth of the Tyne they should be put in such a manner as to direct both the flood and the ebb upon the bar, 4719, 4720.—The outer extremity of the northern pier is left open; the flood tide would flow in, but it certainly would be obstructed by the timbers, 4721, 4722.—In regard to the south and north piers, as proposed by witness, the north pier being open, the south pier would lead to a reflection of the tide wave into the Tyne, and would to a certain extent assimilate it to the state of things which exists in nature on the Yorkshire headland, as compared with Hartlepool, 4723, 4724.—Thinks that, for the proper treating of the mouth of this estuary, there should be inner piers, such as witness has placed above the Narrows, near Clifford's Fort, 4725, 4726.—The object of these piers is first to catch the young flood as early as possible coming from the north, and to turn it into the harbour, and then to direct it by means of inner piers, that the flood tide should go in as true a channel as possible over the bar, both on the flood and on the ebb, 4727.—Mr. Brooks' plan for piers in 1845 is quite different from Mr. Walker's. Mr. Brooks' north pier would, except that it extended further out than witness's, and was solid, act in the same manner, 4728, 4729.—Thinks any north pier should be connected with the land, to have the eastern and western portion of it of open framing, for the purpose of admitting the tidal waves and dispersing them over the receptacle on the northern side, 4730.—Thinks that the water would become still over the Herd Sand, as at Beaching Basin, if these piers were constructed, 4731, 4732.—There is very little difference in the piers proposed by witness and those laid down as Mr. Rendel's piers, 4734, 4735.—Mr. Rendel's northern pier is shorter than witness's, and isolated. Witness's is connected with the land, and in part left open externally and internally, 4736.—Connects the fact of the water having risen so high at Biddick formerly, with there having then only been a south pier, 4737.—Thinks that the south pier placed in that manner at that time without the north pier, having reference to the set of the flood, had an essential effect, and was connected with the rising of the water to the height it did at Biddick; that effect of the momentum of the water has to a certain extent been diminished since the north pier has been erected at Sunderland, if the plan be correct, 4738, 4739.—Mr. Rennie laid out those piers; he does not allude to the state of the sand as having anything to do with the north pier. In his report he states that his reason for altering the north pier, and placing it more northerly, was for the purpose of admitting the waters more readily than before, 4740, 4741.—Witness thinks that if the north pier and the north dock were wholly removed, and only the south pier remained, there would be a larger quantity of water passing up the Wear, 4742.—Confirms the extract just read that the improvements have caused the high water of spring tides to attain nearly the same level at Biddick as at sea, 4743, 4744.—Thinks there is less sand in the Tyne now than formerly, 4745.—The depth and width of a river like the Tyne are both of great importance, 4746–4748.—The drainage of the Wear has been improved lately. In former times there was a greater damming up of flood water, 4750, 4751.—With a shallower navigation or a higher bed the waters would be impounded in the river; they could not run out; they are so delineated on the longitudinal section, 4753.—The majority of plans show the north pier projecting rather farther than the south pier at Sunderland, 4754. —With reference to the mouth of the Tyne the north pier is proposed partially as an open pier, and the south pier projects considerably beyond it; to some extent the flood tide would come in through the open part, 4755, 4756.—Does not propose it to be open throughout to the bottom, but solid to a certain height, and open above half-tide, 4757.—The ebb tide will be guided by the solid part of the pier, and conveyed out along with the other body of water straight forward, 4758.—It is an important thing to bring the body of ebb and flood to bear upon the bar, 4759.—Does not think any body of water will get out through these openings in the piers; a small lateral motion may be given to the first part of the ebbing waters, but not much, 4760.—Witness has merely drawn his plans for his own satisfaction, and from his own experience, 4761.—Thinks that his piers would shelter ships better than Mr. Walker's, 4762–4764.—The chart shows the

MURRAY, JOHN—*continued.*

present bar at the mouth of the Tyne; but the bar will be altered in its position by piers either of a shorter or of a longer kind. Mr. Walker's or Mr. Rendel's piers may cause it to be in a totally different position. The nine feet bar which now exists in the interior portion of the harbour will be dispersed by the building of those piers at the Narrows, for the current would be directed outwards, 4765.—The bar at Sunderland is 100 feet beyond the piers heads; there is about four feet of water upon it at low water of spring tides, 4766–4768.—There must necessarily be a bar at the mouth of every tidal river, but there may be a great deep estuary with no bar; for instance, the Firth of Forth and the northern mouth of the Thames, 4769.

NARROWS:

The breadth of the Narrows has considerably diminished in witness's time, *Straker*, 43.—Was wider fifty years ago than it is now, *ib.* 303.—Are contracted, *Lamb*, 393.—Are much narrower than they were 30 years ago, *Poppelwell*, 664.—The north side is a good protection to the harbour; if that point was all dredged away it would be a great injury to ships in the neighbourhood, *Danson*, 1548.—There are generally about 800 ships lying there, *ib.* 1554.—The one great cause of the limited width, is the set of the current of the flood tide, *Brooks*, 2003.—It is necessary to define and permanently fix a considerable length of the channel at the Narrows, and so witness laid out the works, *Rendel*, 3951.—Believes it to be an essential part of any plan to build guiding piers at the Narrows, *ib.* 3954.—It is connected with the way in which the flood tide enters the river with the loose banks of sand which constitute Herd Sand and the shores at the Narrows, and with the tendency which the flood tide has to follow the course of the ebb tide without making a straight channel through the insand. Guiding piers would materially remedy these evils, *ib.* 3954, 3955.—To maintain a good channel between the Narrows and the pier heads, it must be confined between guiding walls, *ib.* 4089.—It is the Narrows which regulates the quantity of water both going out and coming in. There is a marked difference in the progress of the tidal wave above and below Bill Point, but that might have been predicted; it is a very sharp curve, and must check the momentum of the tide receding, *Stephenson*, 4170.—If Jarrow Slake and the river above it were enlarged, so that the quantity of water at high water should be double the quantity it is now, there would be a greater velocity through the Narrows, which would tend to enlarge that contracted place, *Walker*, 4462.—Navigation would be better in that confined channel without the tidal water, which on each tide would be received over the sloping shores, than with it, *Brooks*, 2512.

NENE AND OUSE:

Have no sea bar or cross current tide at their outfalls, they both discharge into the Wash, *Rendel*, 4374, 4375.

NEWBURN QUAY:

Measured here the quantity of water discharged from the Tyne, and compared it with the quantity going through Newcastle Bridge in the same flood, *Taylor*, 2830, 2831.

NEW COMMISSION:

Was a Commissioner in 1850, when the new Commission was appointed. Was appointed on the new Commission, and is still a Commissioner. *Straker*, 880, 881.

NEWCASTLE:

At the present moment a vessel drawing 17 feet water could come up to Newcastle Quay, *Brooks*, 2220.—The works of the river below Newcastle should be constructed with reference to the freshes and the tidal waters, *ib.* 2520.—Denies that there is generally a majority in the Commission in favour of Newcastle interests, *Cowen*, 3715.—There is an undue delay in the arrival of the tidal wave at Newcastle, *Rendel*, 3943.—Whatever works depress low and raise high water, or increase the column of tide, is evidence of improvement, *ib.* 4031.—It would be possible to have a good deep channel at Newcastle, and a bad state of the bar and sea entrance, *ib.* 4380.

NEWCASTLE BRIDGE:

The water falls there a foot more than it used to do, *Brooks*, 2202.—There is deep water immediately below the bridge, but it is a mere pool caused by the overflow of the floods, *ib.* 2744.

NEWCASTLE QUAYS:

Since the present Commissioners have become conservators of the river they have expended money in dredging in front of Newcastle Quay, *Straker*, 203.—Was rebuilt just previously to the formation of the present conservancy, *ib.* 204.—Vessels drawing 14 feet water can now go up to it, *Wake*, 2992.—It is possible upon a very high tide that 20 years ago ships drawing 14 or 14½ feet water could come come up to Newcastle Quay. It would not be an ordinary tide. The ordinary draught of water of vessels coming up to Newcastle Quay is from 11 to 13½ or 14 feet, but it would depend upon the quantity of cargo on board, *Dunn*, 3253–3255.

NORTH SHIELDS AND QUAY IMPROVEMENT BILL:

Was examined before Captain Washington on this Bill, 1842, *Brooks*, 2320.—The corporation were the opponents, *ib.* 2349.—Mr. Rendel approved of it, *ib.* 2351.—North Shields party have been very much interested to get a quay at North Shields; they have been several times to Parliament, *Robinson*, 3830.—Explains the proceedings connected with it, *Philipson*, 3864.

NORTHUMBERLAND DOCKS. *See* Docks.

PALMER (MESSRS.):

Objected to licences being granted to them, *Purdo*, 513.—Made a motion with reference to Messrs. Palmer and Company's application, that a return of the quantity of land which was applied for, or which would be affected by the grant, skould be given, *ib.* 531.—It was nearly eight or ten months before it was obtained, *ib.* 533.—Concurred in Mr. Straker's motion, that Messrs. Palmer and Co. having raised the river wall at Jarrow to within a few inches of high-water mark without permission of the Royal Commissioners, the same be ordered to be lowered to the level originally proposed by the Commissioners, *ib.* 534, 435.—When Messrs. Palmer's enclosure was sanctioned by the Commissioners at large, there was no special plan of the work before them, *Stevenson*, 1091–1106. When the grant of land to them was agreed to, they submitted a plan to the Commissioners, *Brooks*, 2155–2157.—They are lessees of part of Mr. Ellison's property, and also part of Mr. Brown's, *Clayton*, 3332.—Extract from minutes of the Commissioners with reference to Messrs. Palmer, *ib.* 3332.—Extract from letter to them, *ib.* 3336.—Witness was one of the Commissioners who went to see where the line was to extend on Messrs. Palmer's property, *Cowen*, 3602, 3603.

PALMER'S QUAY:

The piling in front of Palmer's Quay was done without being ordered by the Commissioners, *Straker* 883, 884.

PARLIAMENTARY POWERS:

On an occasion preceding the 29th of September notice had been given of a motion to this effect, "'That "parliamentary powers be applied for, with a view to "obtain authority to apply the proceeds of land to be "taken from the river for the benefit of the funds of "the Tyne Improvement Commission." The motion was not given by witness; it was a mistake; he gave notice of a different motion, *Allhusen*, 3759.

PARLIAMENTARY WORKS:

The Admiralty have an express control over the parliamentary works, *Robinson*, 3854,

PELAW AND HEBBURN SHOALS have likewise been dredged, *Straker*, 100.

PEARSON, MR. WILLIAM. (*Analysis of his Evidence.*)—Holds in his hand a private memorandum book; a copy of the reports sent to the Trinity House of the soundings of Shields Bar, at spring tides, low water, and the rise of the following tide, and the remarks on the bar are what are called the Shields pilot's marks

PEARSON, Mr. WILLIAM—*continued.*

443.—The first taken was in 1848, and on the conservancy inquiry the soundings were given to 1850, and they are made up to the present time, 444.—All contained in that book, 445.—To the best of his knowledge it is correct, 446, 447.—The bar is sounded by two experienced pilots every spring tide, once a fortnight, 448–450.—When witness first went to Shields, in 1846, took the soundings as they had been taken before, and reported them once a month without reference to spring or neap tides, and the Trinity House thought it would be much more accurate that they should take them on the spring tide, 452.—They take them two days after the full and change of the moon; considers that the best tide, 452, 453.—There cannot be any gauge upon the bar; it is impossible. They have a properly marked pole; the men go down, and they take the greatest depth of water on the bar at low-water spring tides, and then the rise of the following flood tide. They have particular marks: old Prior's stone, covering twelve feet, is their guide for watching the bar, whether it is better or worse, 454.—Went there in January 1846, 455, 456.—When witness went down there, there was a vessel sunk upon the Insand, the "Lady Faversham," and the bar was bad; but after her removal it got gradually better, and now it is favourable; it is better this year than it has been, 457.—Took the average last night of the last four years of the difference at low water spring tide on the bar, 458.—It reduces after 8 feet 4, down to 6 feet 10, 459.—Had to make a monthly report to the Trinity House, 460.—These are all taken on spring tides, 461.—There is no memorandum made of the length of the bar; it varies very much, 462.—The position of the deep channel is mentioned, 463.—The position of the lighthouses denotes the deepest water across the bar, 464.—These remarks are meant to indicate the position, 465.—The position of the channel of the bar as well as the depth of it varies, but the bar has been very straight lately, 466.—Mr. Calver's soundings would give the breadth best, 467, 470.—Thinks 24 feet is about the greatest depth they ever had, 471, 472.—The average depth in 1851, at dead low water, was 6 feet 9¾ inches, and at high water 14 feet 4 inches rise of tide. In 1851, there was 21 feet 1¾ inches, 473, 474.—In 1852, 22 feet 8; in 1853, 21 7½; in 1854, 22 feet 2, 475.—They get the rise of tide to add to the depth which they find at low water from the Coble landing, 476.—They have a post to measure by. Believes it is as correct as can be, 477.—Does not know of his own knowledge that it is correct, has no doubt of it; they take ships to sea by it, 478.—Is dependent upon experienced pilots, not upon hearsay, 479, 483.—Has no doubt their measurement is correct, 484.—It is a post on the side of the wall, 485.—There are no particular feet marked upon it, but it is measured and marked by the men themselves, 486.—Pilotage is charged by the draught, 487.—Is a servant of the Trinity House, 488.—The Trinity House have a tide gauge at the lighthouse, 489.—It is for the ships in the harbour and ships going down; it is regulated by witness's soundings. Witness's orders from the Trinity House are that the bar is to be sounded at dead low water spring tides, and to report to the light keeper that sounding. Supposes he regulates his tide gauge by the soundings, 490.

PHILIPSON, RALPH PARK, Esq. (*Analysis of his Evidence.*)—Is one of the Tyne Improvement Commissioners, 3858.—Also a Commissioner of the River Wear, 3859.—Is a solicitor, 3860.—Is largely interested in collieries, 3861.—The coals of these collieries are shipped partly at South Shields, and the remainder opposite the Hay Hole Dock. Himself and partners ship annually about 300,000 tons at these places, 3862.—His sole interest is in the lower part of the river, to have a deep-water channel from the Hay Hole Dock to the sea, and the least possible obstruction in the shape of a bar. Has no trading interests above those points, 3863.—The Quay Bill which was projected for North Shields was thought to encroach too much on the valuable berthage of the harbour, and to interfere seriously with the passage of ships. The Commissioners did not oppose a proper quay at North Shields. Reads resolutions on that subject on the 10th of April 1851, and the 24th of April 1851. During the discussion Captain Purdo was so convinced that what was wished was fair to Shields, that he voted against the motion he had himself seconded, and in favour of the amendment. The chairman and clerk to the Commission were then empowered to meet the promoters of the Bill, and a quay line was agreed upon, and there never was the slightest wish to prevent the burgesses of North Shields from having quays erected, 3864.—The Bill passed, but the work has never been executed, 3865.—Did not attend the meeting in May 1852, when the licence was granted to Messrs. Palmer and Company to form a jetty and make a quay, 3866. In August 1853 had ceased to be a Commissioner. Was informed by Mr. Palmer, who is a friend of witness's, that there was some misunderstanding with respect to the quay for which he had applied at Jarrow. Went with him to the Commissioners. Had some little discussion on the subject, but very little, as the Commissioners were going on a view. Then recommended him to write them a letter, embodying his sentiments. Acted simply as a friend, and not professionally, 3867.—Mr. Palmer is partner in the firm of John Bowes, Esq., and partners, the largest coal exporters in the Tyne. During the last year they shipped thence 500,000 tons, which, added to the portion they converted into coke, would make 850,000 tons. Mr. Palmer is also a proprietor of two extensive manufactories, employing 1,000 hands, and witness certainly did think that persons who shipped to such an extent in the Tyne, and contributed also, as manufacturers, so largely to its prosperity, should receive every accommodation which would not be injurious to the navigation of the river, 3868.—The whole trade of the Hay Hole Docks is carried on by Newcastle coal-owners. Though these docks are locally within the borough of Tynemouth, does not believe there is a person in that borough who has the slightest interest in the trade on that shore, 3869.—Decidedly thinks that the corporation of Newcastle have suffered as much as they have gained in respect of their river frontage, by the operations on the river. The claims upon them for compensation are fully equal to the value of any land they may have acquired; they never thought of supporting any enclosure of land to make money by it. As a proof, the land about Walker and its district has been acquired, not so much for the corporation of Newcastle as for the benefit of those holding leases, who have built manufactories upon it, and who could not, without the grossest injustice, have been deprived of their river frontage. The compensation to those parties would have been enormous, as it was not the simple value of land, but manufactories and buildings upon it, 3870.—As a proof that the Commission has worked efficiently, would point out the arrangements made for the piers, for the Hay Hole Dock, and for the Jarrow Dock, all measures of great importance. Believes the Commissioners are all desirous to do what may be best for the interest that is committed to their charge, without any ill-feeling towards one another. The only vexed question remaining is, whether there should be half-tide or full-tide walls. As one of the majority, would observe, that if it could be shown that what had been done on the river was injudicious or improper, it would not be pursued. Does not believe any of the Commissioners are adverse to the port of North Shields. The trade of this district must be viewed as a whole, and if North Shields increased in importance, is quite sure the trade in the district and town in which witness resides would be benefited. There is no adverse interest of any description, 3871.—At Sunderland the works have been carried on under an Act of Parliament, 3872.—There is a river line drawn, and works cannot be carried within that line without the consent of the Commissioners, and also of the Admiralty engineer, 3873.—The works executed at Sunderland have not altogether been done upon plans adopted by Parliament. The piers, for instance, are sanctioned by the Commissioners under the advice of their engineer, 3874.—The works are not under the control of the Admiralty, 3875.—Several years ago a plan was drawn by Mr. Rennie, and no one can come beyond that line, without his proposed works first coming before the Commissioners, and then before Sir John Rennie, 3876.—Does not know what the minority here have contended for, except the question of half-tide walls, 3877.—Does not believe the absence of a definite river line is at the root of many of the questions about encroachments and walls. Believes the majority and minority are in perfect accordance substantially as to where the river lines should be, 3878.—The Commissioners have not been called upon to offer any opinion as regards Shields Harbour. The Commissioners representing North Shields have never brought any charge of neglecting that harbour; they have

PHILIPSON, RALPH PARK—*continued.*

never brought forward any works they wished executed, 3879, 3880.—Has no doubt the corporation of Newcastle have spent some money in Shields Harbour, 3881.—While witness has been a member of that corporation does not remember any suggestion from North Shields of works they wished executed, 3882.—Denies that any application would have been useless. The corporation have no hostile feeling towards the people at Shields; they are quite ready to give them any just attention in their power, 3883.—The resolutions about the Quay Bill of 1851, read by witness, were under the advice of Mr. Brooks, 3884.—The line for which the promoters went to Parliament was sanctioned by Mr. Rendel, but does not remember about the Admiralty. Many persons interested in North Shields thought the line came too far into the river, and would interfere with the berthage, therefore the Commissioners wished that a line should be agreed on between Mr. Rendel and Mr. Brooks, so that all the residents of North Shields should be satisfied, 3885.—Does not recollect that Mr. Brooks objected to it, because he insisted upon a line which should take the front of Smith's quay, cutting off Whitehill Point, but knows the Commissioners did not, 3886.—Smith's quay is a valuable one, 3887.—It is considerably within Mr. Rennie's line, 3888.—The quay no doubt was diminished one half in length, and also diminished in breadth, but still so adequate for the wants of Shields, that the promoters of the Bill agreed with the chairman and clerk to the Commissioners to arrange the matter, 3889.—Never found the inhabitants of North Shields loth to find money to fight any battle in which their interests were involved, and does not believe that had any influence in the matter, 3890.—It was a meeting between the chairman, Mr. Clayton, and the promoters of the Bill, which led to the arrangement, 3891.—There was a motion in the corporation that the rent roll of their whole estates should be printed, but not alone the rent roll of their river-side property, 3892, 3893.—Cannot say the area of the land which the corporation have formed from the river, 3894, 3895.—The places of business of the Newcastle coal-owners are at Newcastle. There is an Act of Parliament which gives the Trinity House the power of licensing the pilots for the Tyne, both on the river and along the coast. Mr. Wake can give the information, 3896.

PIERS:

The Commissioners appointed Mr. Brooks to draw the plans, and Mr. Walker to approve of them, *Poppelwell*, 724.—Thinks the Admiralty consider Mr. Walker responsible, *ib.* 725.—No great progress has been made with the piers; the engineers never understand each other, *ib.* 732.—Objects to Mr. Rennie's south pier, *ib.* 807–810.—Likes both the new piers which are now planned, if only there were money to complete them, *ib.* 811.—Statements respecting Mr. Walker having the entire superintendance of the piers. Complaints of the clerk having communicated such important resolutions verbally, *Linskill*, 954–965.—There was a division upon the motion that Mr. Brooks should assist in the working drawings, it being the general opinion that he had not time to attend to the piers properly, *ib.* 966–969, 1026–1032.—There has been considerable difference of opinion as to the position and size of the piers, *ib.* 974, 975.—When the piers which are intended to be erected at the mouth of the Tyne are formed, the Narrows themselves will be improved by that very operation, *Calver*, 1815.—Thinks the erection of piers would correct a confusion of sets which exists at the present time; thinks there would be an improvement in the flood-set especially, *ib.* 1880.—The Commissioners are about to execute piers at the mouth of the harbour, *Brooks*, 2016–2022.—Mr. Walker's pier on the south side is a mere rubble pier, *ib.* 2238.—Piers would be an advantage; would make the harbour smoother, *Wake*, 3023.—The Commissioners consider the piers the greatest object of all in reference to the Hay Hole Dock, *Clayton*, 3310.—Sir James Graham and Mr. Cardwell think that a special tax should be levied on the banks of the Tyne, for the purpose of erecting piers, *ib.* 3562, 3563.—They look to a small tax upon shipping for raising this fund, *ib.* 3564.—Piers at the mouth of the river would become a benefit to the country at large, *ib.* 3571.—The whole of the revenue, about 11,000*l.*, was expended last year; 6,000*l.* was paid to the Dean and Chapter of

PIERS—*continued.*

Durham for 36 acres of ground, and the Commissioners are under a contract for about 5,000*l.* to make a railway to begin the piers, *Cowen*, 3615.—Since witness entered the Commission they have done nothing but labour at the piers without producing any result. It is not the fault of the Commission, but of parties over whom they have no control, and who have no control over them, *Mather*, 3773.—The Trinity House generally is in favour of the piers, but there is a difference of opinion as to the mode of construction, *Wake*, 3922–3925.—The breadth of the entrance between Mr. Walker's piers is 1,100 feet; it is large enough if they can maintain it, *Rendel*, 3944.—Gives his opinion on what is taking place on Mr. Walker's plan, and illustrates it by referring to Liverpool, *ib.* 3967.—Has no objection to a north shore pier, if only the south pier is sufficiently beyond it, *ib.* 3968.—Believes that the result of Mr. Walker's piers, if laid down as at present planned, would be that the tide running across their heads would form a bar from the north pier, and that such bar would cause the stream to enter in a direction that would produce eddies and banks within the pier heads, *ib.* 3972.—Any piers at the mouth of the Tyne which would not give a straight course for the stream of tide into and out of Shields Harbour would produce the worst consequences, *ib.* 3973.—If a north pier were built, the south pier should be extended beyond it, *ib.* 4076.—In the proposal made by Mr. Rennie many years ago to continue the channel of the river, as it were, by a pier nearly parallel with the present channel, he evidently had in view nothing but the scouring of the river, to push the bar further out to sea. Witness thinks he did not give sufficient importance to the question of ships coming in there under a north-east gale, *Stephenson*, 4106.—Thinks although the two piers cause a structure the current will be more direct than it is now, *ib.* 4143.—If it is a question of navigation, which should always be kept in view in dealing with piers of that kind, it must be considered how a ship can be manœuvred; supposing ships coming in under sail from a north-east wind in distress, thinks the long pier should be to the windward, *ib.* 4155.—The pier question is purely a naval one, *ib.* 4260.—The ebb tide in witness's opinion would be unable to check the growth of inner and outer shoals, unless guided and aided in its course between a portion of the two piers made parallel to each other, and by the construction of guiding piers at the Narrows, as in witness's design, *Rendel*, 4301.—Gives explanation of the plan he proposes, *ib.* 4305.—One of the objects to be attained by witness's design was to increase the quantity of tidal water going into the harbour, *ib.* 4335.—Thinks the bar would be carried with Mr. Walker's piers, and in this position, it would interfere with the navigation, and with the quantity of water passing up and down the Tyne, *ib.* 4341.—If these piers were constructed, thinks they would form a sand trap rather than a navigable channel or a harbour of refuge, *ib.* 4347.—Piers would be a very great improvement; at present ships have great difficulty in entering the harbour during storms, *Walker*, 4437.—Considers the piers quite a separate work from the river, *ib.* 4446.—Witness explains his plan of piers, 4477–4485. — Should endeavour to keep the two piers going on together, believing that it will not be a perfect work until both are done, *ib.* 4499.—Both are for giving shelter, and also for carrying the ebbing river tide to join the ebbing coast tide, and carry the bar away from the mouth of the piers, *ib.* 4500.—Recommends the piers entirely on his own responsibility as an engineer, *ib.* 4524.—There would be no sea inside the piers, *ib.* 4527.—The sand would grow up against the piers, but not in the channel, *ib.* 4528, 4529.—Regards the state of things when these piers are made as the filling of an internal receptacle, and that therefore the quantity of water going in will depend on the amount of that receptacle. *ib.* 4535–4538.—When the piers are constructed the current of the flood tide will be nearly at right angles to the entrance, *ib.* 4537.—The principal benefits from the piers will be the sheltering of ships either making for or going out of the harbour, and so guiding the current of ebb as to get it out into deep sea, and in fact to get the bar out into deep sea, and witness hopes diminishing the bar, *ib.* 4554.—States his views on the subject of piers for the Tyne, and produces a sketch of the same, *Murray*, 4592.—Thinks the longer run into the harbour proposed by Mr. Walker would be beneficial, *ib.* 4593.—Presumes Mr. Walker's piers would be much more expensive than his, *ib.* 4594.—Particulars of the, *ib.* 4625–4635.—Thinks the south pier at Sunderland

PIERS—*continued.*

being made parallel to the north rather renders a facility to ships entering that harbour than otherwise; the current carries them forward. Would rather both piers had been parallel than the sort of trumpet mouth which is given to the pier, *ib.* 4651, 4652.—Particulars of, *ib.* 4652–4662.—Approves of Mr. Walker's piers for dispersing the waves, *ib.* 4702.—Considers that it is an important feature of engineering that whatever piers are put at the mouth of the Tyne they should be put in such a manner as to direct both the flood and the ebb upon the bar, *ib.* 4720.—The bar would be outside the piers recommended by witness, *ib.* 4719.—The outer extremity of the north pier being left open, the south pier would lead to a reflection of the tide wave into the Tyne, *ib.* 4723.—Has placed some piers above the Narrows, near Clifford's Fort, as it is called, *ib.* 4725–4728.—The piers which witness recommends for the Tyne differ very little in principle from those which witness has laid down as being Mr. Rendel's piers, *ib.* 4734.—If the plan be correct, it is the fact that since the north pier has been erected at Sunderland that effect of the momentum of the water has to a certain extent been diminished, *ib.* 4739.—Believes that if the north pier and north dock were wholly removed, and only the south pier remained, there would be a larger quantity of water passing up the Wear, *ib.* 4742.—Witness states he prefers his own piers to Mr. Walker's, both in an engineering and in a nautical point of view, *ib.* 4764.

PIER, NORTH:

It would not give shelter to vessels making for the harbour; but witness's would lessen the amount of broken water at the entrance in north-east gales, *Rendel*, 4323.—Strongly objects to a north pier, if connected with the land, *ib.* 4341.

PIER, SOUTH:

"The first work set in hand should be the south pier," to get the tide as early as possible upon the young flood into the river, *Rendel*, 3939, 3940.—As at present proposed, it will destroy the wheel, which is the chief agent which carries the sand from the Herd into Shields Harbour, *ib.* 4296.—As proposed by Mr. Walker, there would certainly be room for the wave and the current to expand, and consequently to diminish, so that it would have its power to hold the sand in suspension, *ib.* 4303.—Thinks there would be a tendency to sand up by Mr. Walker's plan, but not by witness's, *ib.* 4307.—There will be such an inrun of the sea, that it will bring down the sands, and spread them over this wide space, *ib.* 4315.

PIERS' COMMITTEE:

The Piers' Committee, which had the charge of the plans for piers with which Messrs. Bobinson and Clay waited upon the Lords of the Admiralty in January 1855, comprises eleven out of eighteen members of the Commission, who were unanimous in their adoption. Messrs. Clay and Bobinson were charged with the working drawings and specifications by the Piers' Committee, *Clayton*, 3450-3452.—The Piers' Committee do nothing that they do not bring before the next meeting of the Board, *Cowen*, 3646.

PIER DUES:

I believe our pier dues are about 12,000*l.* a year, *Poppelwell*, 763.—The income from pier dues is about 12,000*l.*, *Brooks*, 2021.

PILES:

There are twenty-two piles standing a little above Palmer's Place. These were driven without the consent of the Commissioners, *Purdo*, 516.—Were driven between the point that Mr. Palmer was allowed to carry his jetty to, and the point that Mr. Bowes carried his without having a licence for it; they had no connexion with the staith; understands they were driven by the Commissioners' pile driver, but does not know for what purpose they were driven, nor who sanctioned his employment, *Purdo*, 596-599.

PILOT:

Is paid by draught, *Wake*, 2995.

PILOTS:

The Trinity Board practically appoints them, *Wake*, 3903.

PILOTAGE:

Is charged by the draught, *Pearson*, 487.

PLAN:

The secretary has the plan accompanying witness's report in January 1843. The river line are the same, with the exception of a fresh blue line in the neighbourhood of Jarrow, making the river a mile wide, *Brooks*, 2026-2035.—Mr. Rennie's plan, when delivered in, was in the same condition as it is now, *ib.* 2459.—The plan has been produced on public occasions, *ib.* 2463.—It is kept at the office of the Commissioners, *ib.* 2466.—Plan of the improvements made in the River Tyne under the direction of the Corporation of Newcastle, upon-Tyne. This was also used by the Commissioners, *ib.* 2471.—The river lines were upon this plan; they deviated very little from the plan of 1843, *ib.* 2474.—It has been produced upon almost every meeting of the Commissioners, *ib.* 2475.

PLAN OF THE TYNE:

Has never been unfolded properly, *Stevenson*, 1450.

PLAN, PARLIAMENTARY:

Mr. Walker adopts, with some variations, the parliamentary plan of Mr. Brooks and the Commissioners, *Clayton*, 3311.

PLANS:

Never saw any plans showing the quantities proposed to be dealt with when questions have been about licences and grants of foreshore, *Linskill*, 923.—Never saw any in the case of Palmer and Brothers, *ib.* 924.—The only plans witness ever saw, were those printed and lithographed in 1851, *ib.* 1008-1016.—Produces several plans, and explains them, *Brooks*, 2240.—Have all been shown to the Commissioners frequently, *ib.* 2402.—There has always been access to any of the plans in the possession of the Commissioners by any member of the Commission or the engineer, *Cowen*, 3608, 3609.

PLANS OF THE TYNE:

There have been three very important ones, made by three distinct parties, Mr. Giles, Mr. Comrie, and Mr. Calver, *Brooks*, 2452.

POPPELWELL, Mr. MATTHEW. (*Analysis of his Evidence.*)—Is a Lloyd's surveyor, 653.—Resides at North Shields, 654.—Signed the letter to Sir James Graham, and the memorial, 655.—From the minority of the Commissioners, 656.—Has known the Tyne since 1802, 657.—Has been invariably at work on the Tyne for the last 20 years, 658.—With respect to the bar, is of opinion that the port is shoaler than it was 40 years ago, 659.—Has not sounded latterly, but sounded regularly 30 years ago, and there was a very broad entrance then, 660, 661.—Should take Mr. Calver's soundings to be correct, and should say the whole space of the bar has decreased in breadth, although the channel across the bar and the outlet may be nearly as good as it was, within six or seven inches, 662, 663.—The Narrows are much narrower than they were; on the north side there has been an accretion, 664, 665.—Refers that accretion to material washed in by the flood, and the decrease of the ebb for getting it out again, 666.—Has no doubt less flood comes in, 667.—Has been acquainted with, and watched the Willington Quay, and the way in which it has affected Hay Hole, 668.—Those staiths had a tendency to shoal, and they have to this day, 669.—It was witness's first opinion in the case of the Hay Hole Dock in 1850, that there should be some compensation for the water abstracted. First mooted that question, 670, 671.—With reference to the subject of taking water from the tidal area, has always been of opinion that compensation should be afforded, 672.—For the purpose of keeping as much water as possible up the river, or to increase if possible for scour, 673.—Thinks the sailing channel in the river is better than it was. Thinks the track of the navigation is rather deeper than it was, but as a river worse, 674.—It is narrower, 675.—Believes about 20,000 tons of material were taken out by dredging, to let the Sardinian frigate go down, 676.—Believes it cost the Commissioners about 600*l.* or 700*l.*, 677.—In 1850 application was made for a licence to deposit ballast between high and low water-mark. Witness opposed it by all the means he could, 678.—Believes

POPPELWELL, MR. MATTHEW—*continued.*

the licence was granted, 679.—Believes licence is given by the Commissioners to the parties asking it, on certain conditions of their paying so much to the Commissioners out of the 1*s.* 4*d.* which they receive for the ballast, 680.—The corporation wanted 1*s.* or 10*d.*; thinks they get 8*d.* or 9*d.*, 681.—The Commissioners pay the corporation, or other persons who have a licence for depositing ballast, 8*d.*, 9*d.*, or 10*d.* a ton, 682.—Presumes it is a matter of profit to the corporation, 683.—Has not seen the accounts, 684.—At the time of granting the licence witness objected to the payment which the corporation sought to receive from the Commissioners with respect to this ballast, because, as the old conservators of the Tyne had granted a licence to another gentleman, Mr. Mordue, at Wallsend, at the rate of 6*d.*, who was depositing ballast on the foreshore of the river joining the same place then asked for a deposit, that they should now come to the Commission and ask for 10*d.* a ton to another gentleman; it was not worth to them, as old conservators, more than they would give to other persons, 685–688.—Objected to the rate, on the ground that it was too high, 689.—The ground of that objection was that the corporation had themselves, when conservators, granted a licence to another person at the rate of 6*d.*, 690.—Took an active part in the Conservancy Bill, 692.—Ballast still washes into the river in smaller quantities. Believes that the Commission upon that point has done some little good, 693.—If the present state of things, as regards the ballast question, remains, it is a premium, so to speak, upon ballast being allowed to go into the river; because, if you put a ton of ballast into the river, of course the corporation, or any party else, gets the money for that ballast so lost; but the conservators have to dredge it out again, which costs them 7½*d.* a ton to take it back again, 694, 695.—Persons who get a licence to deposit ballast, receiving a payment, use it for the purpose of making land, 697.—Should think there would be 140 to 150 acres made now, 698.—Concurred in applying for returns as to the quantity of abstraction from the tidal area that has been made into solid land, 699.—Has not received them yet, 700.—Thinks the tidal area so made into solid land is worth 1,000*l.* an acre, 701.—Decidedly made by the river funds, 702.—The shipowners pay it all, 703.—Has taken part in the discussions as to adopting the system of carrying ballast out to sea in ballast hoppers, 704.—Approved of that, 705.—Agrees with Mr. Straker's evidence; it is very distinct and very clear, 706.—If you had a half-tide wall, the wash of the river would prevent the accumulation of the mud above the level of that half-tide wall, 707.—Would deal with the whole river with training walls. There are large slakes, such as Willington Slake, Wallsend Slake, which are marked on Rennie's chart, which contains about 140 acres of water. Those slakes witness would have kept open. At Wallsend they have lost the old deep channel north of the training wall; between this wall and the Cockcrow Sandbank the channel is at present so very narrow it has become dangerous as a sailing track; having lost the old north channel, the ships loading at the Wallsend staiths leave no room for navigable purposes. Would have loaded within the training walls, in the old channel of the Wallsend Slake, then this narrow channel would have been kept clear, also keeping those slakes full of water, which would be by the influx of sea water every flood tide; it would increase the scouring power, and more effectually prevent the sand lodging, as it now is, in the Jarrow Reach. By the present system they are reducing the power of scour; would not, therefore, have filled up within the whole lines, but proper narrow parts might have been filled up with discretion, and the slakes mentioned might be kept open to assist the scour, and they would also have been beneficial to the shipping interests, as places of safe moorings, whilst it would have had the tendency to enhance the value of the whole of the river frontage space, 708.—Understood Mr. Straker to say that the whole up to the back of the half-tide walls would fill up in time; witness would keep them open, 709.—If there were only half-tide walls the earth would not become deposited over and above them, 710.—That is partly due to the condition of the river; without a steamer at all it would never fill up, 711.—Knows Cockcrow Sand; it is between the lower part of Hebburn and Wallsend, 712, 713.—There are some jetties at Hebburn, 714.—Notwithstanding those jetties a large portion of Cockcrow Sand remains, 715.—Thinks they create eddies, and hills and holes all through the river, besides retarding the tide getting up and down; they stop the tide by the current and eddies, 716.—Whatever dredging has been done in the Tyne has had good effect, 717.—Wherever the depth has been maintainable, it has been done by dredging. Three or four jetties were run out at Bill Point from the north shore; when you came down to Bill Reach jetties did run out from both shores, but now one shore is walled in; but the operation is this, the jetty above Bill Point, upon the ebb, creates this whirl through the bed of the river towards Pelaw Staiths, and drops the deposit just below Pelaw; the jetties on the flood at Hebburn move the sand (which is a very bad shoal) from the effect of the whirlpool, and drop it again just by Pelaw, and consequently 15,000 tons of sand had to be taken out at that spot, 718.—Training walls would make an even bed, 719.—Believes that one of the objections which were urged upon the inquiry before Captain Washington, and before Parliament, was that the works which had been carried out had been carried out neither upon Mr. Rennie's line nor upon any other line which was produced, 720.—Believes they never met upon the river lines till the 17th of August; made a motion upon it then, that the chairman should allow Mr. Brooks to prepare river lines to give this very Commission information, and that resulted in a River Line Committee meeting upon the 19th, and there they marked lines, 721.—Those lines have not been brought before the Commissioners yet; asked for them at the last meeting, but was put down by its being said that nothing was before the meeting, 722.—Has also asked for information respecting the state of the piers, and the communication upon the piers, 723.—There is not a clear understanding about the piers, but from time to time a motion has been made upon it, and a resolution come to and acted upon. The first was, that Mr. Brooks should draw plans of the piers under the superintendence of Mr. Walker; and after a good deal of correspondence with Mr. Walker and Mr. Brooks together, that seemed to be undone, and then the Commissioners appointed Mr. Walker to be the first engineer, and to draw plans and to take the advice of Mr. Brooks when he thought proper. That seemed to fail, and they got back to the first plan again. Mr. Brooks draws the plans, and Mr. Walker is to approve of them, 724.—With reference to the understanding with the Admiralty upon the question of superintendence of the piers, witness's reading of the letter and instructions to Mr. Walker is clear that they are to hold Mr. Walker responsible, not for the drawing of the piers out, but that he was to be the responsible engineer for the piers, 725.—Should have felt bound to take Mr. Walker, as not only drawing the piers, but finishing them, 726.—Mr. Walker has not appointed a superintendent, 727.—There have latterly been discussions at the meetings respecting the propriety of Mr. Brooks taking the superintendence of the piers, 728.—Knows it was proposed that Mr. Brooks should have it, 730.—Believes Mr. Walker is to be consulting engineer yet, 731.—No great progress has been made with the piers, from the engineers never understanding each other, 732.—And the Commissioners do not seem to have understood very well what the engineers were doing, 733.—That was part of witness's objection of want of system, at the time he wrote to Sir James Graham, 734, 735.—Since the new Commissioners have come into operation thinks the system on the river has gone on every way the same, with the exception of not putting so much ballast into the river as they did before, 736.—Remembers 20 years ago a ship called the "Lady Jane" coming up to Dent's Hole, 737.—Was told she drew 16 feet, 738.—Remembers the "Cove," 739.—Captain Palmer was the owner, 740.—Does not know how much she drew; believes 15 feet 9; did not measure it, 741.—A person named Plummer was the owner of the "Lady Jane," 745.—On the 28th of July last remembers a vessel grounding in the channel; had a letter from the owner upon that vessel, "Tranby," 746.—She grounded at Hebburn Shoal, 747.—Did not see her, but saw the pilot. Witness has the owner's letter to him, 748.—Believes the sailing channel has improved from Shields to Newcastle, 749.—The sailing channel may be improved, and the other parts of the river very bad, so bad as to lose nearly the scouring power, to the destruction of port and bar. Witness had a ship, and went up in the year 1827. She came in from sea 15 feet 6 inches; they lightened her, and she came up 14 feet water, and the other ship, "Tranby," last year only got up at 14 feet 2 inches after grounding. These vessels were nearly the same water in 1827 and

Poppelwell, Mr. Matthew—*continued.*

1854, 750.—Had to pay the pilot 20*s.* to bring her up. The pilots are paid on the water the ship draws, 751. —It might be, as stated in Mr. Armstrong's pamphlet, that in 1836 there was 14 feet or 14½ feet water at Newcastle Quay, 752.—Witness's vessel went up there, and had the best berth, 753, 754.—64,080 tons of ballast were put between high and low water mark in 1853, and 90,934 tons of dredged material, making a total of 155,014 tons. Witness wrote to the London surveyor for a return of what they took out the same time, and they took out 608,000 tons that year, 755, 757. If that had been going on for fifteen years they would have put in a million tons, 758.—The dredging has gone on in the Tyne ever since the first dredger was brought here in 1836 or 1837, 756–760.—Of later years there has been a good deal more dredging done. There is a very good steam dredger now, 761, 762.—Believes the pier dues are about 12,000*l.* a year, 763. —Has no doubt if the river funds during some time back had been applied to river purposes, the river would have been walled from end to end, and cleaned itself out. The piers are a costly thing to the shipowners, 764, 765.—The depth of water on the bar varies with the wind and the freshes sometimes half a foot or a foot at different places. It requires one wind three or four springs before it has that effect; but it will do so, 766, 767.—Understands that, according to Mr. Brooks' evidence in the Commons or Lords, he intends to inclose Jarrow Slake. Conceives the intention is to make from 750 to 800 acres of land from water space. Rennie's plan was to take 448 acres off for his half-tide walls, exclusive of the Jarrow Slake, which contains about 360 acres, thus leaving, by Rennie's plan, 1,250 acres of water at high water. Mr. Brooks' lines will leave about 800 to 890 acres; but his lines will speak for themselves, 768.—Concurred in most of the motions which have been made for abandoning the system or transverse jetties between high and low water mark, and all other matters connected with the cross jetties, as they only made land at the expense of the river funds, and no compensation to the public, 769.—Does not think the new conservancy has worked efficiently, 770.—Thinks it is expedient, having regard to the various conflicting local interests, that there should be some controlling power, 771.—Cannot speak to the year exactly, but has known the bar vary from 6 to 8 feet, 772.—Does not think he has ever known it with only 5 upon it, except once this year, there was 5 feet 10, 773.—The Corporation get this 9*d.* or 10*d.* which has been spoken of as a consideration for machinery and labour. Considers it is river property, and not theirs. It is the highway. They (the Commissioners) have come out 1,200 feet, or are going to take 1,200 feet off from one part of the river at Wallsend. The river is 2,000 feet wide there. Believes the engineer is going to leave 800 feet water space, 774, 775.—Believes it is Dean and Chapter property, but the Corporation have some rights upon it, 776.—Sanctioned the making of a half-tide wall on the south shore, 777.—That 1,200 feet includes the portion sanctioned. States that they found the river in a certain state, and it is their duty as Commissioners to do the best they can to make the best highway; and therefore, upon that ground, sanctioned that half-tide wall; it did not meet witness's full approval, 778.—The ballast is thrown, as a rule, behind the training walls, 779.—Wherever a depth has been obtained it has been done by the dredging, 780, —Knew of the existence of Hebburn Shoal, 781.—Remembers when the jetties were put up, 782.—Knows that repeated attempts were made by dredging to get rid of that shoal before these jetties were erected, 783. —They were not quite so successful as they were afterwards when the jetties were made. It was not good work; it moved the sand from that immediate part and deposited it in another part of the river, which had to be lifted out by the dredger above and below the effect of the jetties, 784.—Dredging brought to bear upon the shoal did not succeed in getting rid of it, but when the jetties were put up with dredging, it did succeed, 785.—They have had a very narrow channel there; the dry lands made since that period upon the south shore immediately connected with the jetties, 786, 787.—Understands the engineer put the jetties up on purpose to make the land. Is speaking without the training walls, 788,—Has seen the land since the erection of the jetties without the training walls, 798.—Knows Bill Point, 790.—The sailing passage of the river has been improved, and the berths of deep water have been taken away, thereby the shipping and merchants have lost a valuable part of

Poppelwell, Mr. Matthew—*continued.*

the river, 791.—There has becen an improvement in the sailing track as to sight, 792.—Bill Point is a dangerous place yet, but was more dangerous before this improvement took place. It is less dangerous, and the sailing channel has been improved since the jetties were put up by Mr. Brooks in that immediate neighbourhood. The same sand bank went down to Pelaw Main, and there they lifted it by the dredger. It is dredging which does it. The jetties only take it to a certain distance; they still have to dredge it out, 795. —Admits it is an improvement for sight, 796.—Is quite certain the dredger has been used a little above Bill Point, 797.—There has been a straighter channel made at Bill Point, 798.—Dredging has not had anything to do with the improvement there; they had to lift the sand up that went from that point, by dredging it out of other parts of the river; but they have lost the deep water berths for shipping. It is a sailing sight improvement, but not so deep a channel, 799.—The channel is deeper than upon the other shoal parts, 800.—Should like to get it deeper; it is a sailing track improvement, certainly, 801.—The depth there is 8 or 9 feet at low water, and about 19 feet at high water, 802, 803.—At the time the letter was written to Sir James Graham the sanction of the Admiralty had been given to the piers, 804, 805.—Meant the plans; does not know that it is given yet to the working drawings, 806.—Is aware that Mr. Rennie recommended a south pier, 807.—Thinks that that would have been an evil, 808, 809. Thinks it would have had a very injurious effect upon the harbour of North Shields in windy weather, 810.—Likes both the new piers which are now planned, if they had the money to complete them, 811.—The land which the corporation have of the Dean and Chapter commences at Willington Quay, and goes up to Walker, about 140 or 135 acres, 812. —(Witness here points out the same) 813.—The Corporation have commenced to deposit ballast upon that site, 814.—And have received with respect to it this 8*d.* or 9*d.* a ton, 815.—If the same system continues the land will really have been made out of the river dues, 816.—Wherever jetties have been carried out, they have carried the sand into other parts of the river, and the dredger had to take it out, 817.—Adheres to his opinion that the substantial improvement of the river has been due to the dredger, and not to the jetties, 818.—Believes that during these few months the bar has been fully as good as it had been for some time; before that it was really shallower, 820.—Thinks he has known it eight feet deep, 821. —The sailing track is now what one would generally call a fair bar; an average bar, 822.—Believes during 1853 it was deepest; and it was a good bar, but not so good during last year, 823.—Thinks the sailing channel has been much the same for the last thirty years, 824.—The bar is not so deep as 8 feet just now; believes it is now about 7 feet 6 inches, 825.—Should not have been aware that the bar was even as it is just now, if he (witness) had not heard the tables read out, 826.—Witness's opinion is founded by those who go to sea in certain tides, and not from soundings, 827, 828.—Knows of his own knowledge that the groins caused hills and holes, 829.—Thinks that those groins protruding from Hebburn Quay, in the last few years have made a complete foreshore, which creates a hill, 830.—Part of that foreshore would be behind the river line, and part without the line, 831.—In the channel, between two river lines, hills and holes are formed. Goes up and down, and bumps over them. Is stopped sometimes five minutes upon them. On the 27th of July 1854 went up with a steamer drawing 3 feet 6, and grounded twice in Bill Reach, upon two hills there, and between them; as he (witness) went, he sounded, and found there was a hole, 832.—It was generally considered a good channel there before, 834. —It appeared to be caused by the protruding groins, from the upper end of Hebburn Quay, 835.—Witness points out the position to which he referred, 836.—Witness was on board. Was just above these jetties (showing them), 837, 838.—It is called Bill Reach; it is half-way up between Walker Staith and the Powder House, 839.—Found three or four shoals, 840.—Thinks it was not quite low water, 841.—It was on the 27th of July 1854, 842.—Has it down here as a little above Walker Spout, above the two groins at Hebburn Quay, and not quite low water, the tide still ebbing; it says, when the boat gets on to one of those sands, we scour away with the paddles and get over it, 843.—Was drawing 3 feet 6 inches, 844.—Was in the best channel, 845,—As a groundwork for his general

POPPELWELL, MR. MATTHEW—*continued.*

opinion that those groins form holes and hills, would mention the groins across from the quay where the new staiths are to Howdon, where there was only 4 feet 3 the other day. That sand is created by setting the sand loose from Hebburn shoal; it is carried down, and from the top of the Cockcrow Sand it is also carried down and below Jarrow. Refers to the part below Jarrow Spout where they crossed the other day. Understood Mr. Brooks that the tide was 2 feet above datum; took a minute down at the moment, 846.—That would be caused by the upper groins sending the water down through the channel, and when it has lost its strength it falls, 847.—It is much below Jarrow Spout. The tide will carry it down to where the deep water is till it finds a less tide, and then it drops immediately. The sounding is 6 feet 3, and 2 feet off makes only 4 feet 3 there, 848.—Asked the learned gentleman some years back as to some 600,000*l.* or 560,000*l.* which was expended, called river funds, but not upon the river. If that had been spent upon the river, thinks there would have been a great improvement, 849.—It is all gone, however, 850.—Believes the Commissioners have agreements with the party who takes the ballast from them to allow them so much deposit room, 851.—They had to pay for the whole 90,000 tons which were dredged and deposited, 852.—The river dues paid for taking it up, but not for the privilege of depositing it, 853, 854.—Understands that with regard to the dredged material, they have liberty to deposit it at the back of the groins. When a party gets a licence he allows them a certain portion of that ground to lay the dredged material, and the Commission pay for it; for the depositing of the ballast, not for the ground, 855, 856.—As far as the works of the river are concerned, they can dredge and deposit it without paying anybody for the privilege, 857.—The payment of the 9*d.* or 10*d.* is with reference to foreign ballast, 858.—A party pays the conservators for a licence to deposit ballast, 860.—Since 1850, a party who wants to deposit foreign ballast comes to the conservators for a licence, instead of going to the corporation, 862.—As part of the terms of that licence, the Commission reserve to themselves the privilege of depositing the dredged material upon the land, 863.—But they agree to pay the party taking the licence a certain sum for foreign ballast. If it was sent to sea in hoppers, and if it could be delivered at sea for half the money paid for it upon the land, they would save half that money, 864.

PORT AND THE BAR:

The great object in the River Tyne is to maintain these, *Calver*, 1852.

PORTSMOUTH HARBOUR:

There is no sediment running into it, *Purdo*, 636.—It is dependent for its existence on tidal water only, *ib.* 637.

POSTS:

Mr. Brooks has attempted to explain them to witness, but not satisfactorily, *Purdo*, 609, 610.

PURDO, COMMANDER WILLIAM, R.N. (*Analysis of his Evidence.*)—Is a Commissioner of the Tyne, 418.—Was one of the life Commissioners appointed and named in the Act, 419, 420.—The Duke of Northumberland wrote to witness to know whether he would accept of it, and he agreed, 421.—Has since given considerable attention to the conservancy of the Tyne, 422.—Was the proposer of some of the first motions respecting the general management, so far as regards a general outline of the river, as pursuing the general plan which Mr. Rennie had laid down, and which Mr. Rendel had brought before them in October 1851.—Witness then commenced the principle, which he wished to be carried out, on the principles which they had laid down for them to steer by. That was particularly to maintain the tidal water, 423.—Never attempted to take any liberties without first of all being quite aware of what these eminent engineers would suggest, 424.—Both those gentlemen concurred in recommending that the river should be treated according to some fixed system, 425.—It was the general principle in the Medway and at Portsmouth to allow no encroachment whatever upon the tidal area, 426, 427.—Knows from the argument of the majority that they intended to enclose to the amount

PURDO, COMMANDER WILLIAM, R.N.—*continued.*

of 440 acres, 428.—Recollects the paragraph in Mr. Rennie's report, with reference to the surface of the channel being reduced 448 acres less than it is now at high water, 429.—Understands that according to his recommendation the channel was to be trained by half-tide walls, 430.—Always opposed the making of land by means of ballast or otherwise, 431, 432.—With reference to the Northumberland Docks, thinks Mr. Rendel was the man who first broached the subject, and proposed a half-tide dock. On these grounds a full-tide dock was generally agreed to by the Commissioners, because it was inferred, if the dock had not been projected, or a half-tide dock had not been projected, the evil would have become so bad, that the mischief would have continued to go on to the staiths below, and therefore the Commissioners very properly agreed to make a dock in some degree in accordance with Mr. Rendel's proposition. The only difference between them is between a half-tide and a full-tide dock. The dock users or dock managers can level the water in the dock to very nearly half-tide if they choose to use it so, or make it deep enough, 434.—There is a very material difference between making dock works in the Tyne and creating solid land, 435.—Concurs with Mr. Allhusen in his motion that the Commissioners should have full authority over the making of any solid land, and that any land so made should be the property of the Commissioners, 436.—Prohibiting the deposit of ballast by private individuals between high and low water mark was one of the first points to which witness directed his attention, because he had been accustomed all his life to take all they could get out of a river, and put nothing in; and as the two engineers (Messrs. Rennie and Rendel) had laid such emphasis on the maintenance of tidal water, conceived it perfectly suicidal to put dredged material or imported ballast into the river, and make land of it, 437.—Has heard the evidence given by Mr. Straker. Concurs with his opinions as to treating this river by half-tide walls, with this difference, that he (witness) would put no cross jetties, nor deposit any material behind the walls. Would train the river with half-tide walls, or quarter-tide walls, rather; and would let the river take its chance, because there would be very little displacement of water; the flow and ebb of the tide would not be obstructed in either way, and, in consequence, a greater volume of water would go up the river. Considers that the cross jetties, which Mr. Rendel totally objected to in his report, have been the greatest possible evil ever since they were projected at all. If half-tide walls had been laid down on a proper line, and carried out with a proper angle, and curved with the rounding of the points, it would have been of the greatest possible benefit to the river, and it would have maintained the water, 439.—Knows very little about the bar: made several motions to get periodical reports on the fluctuation of the bar, but they have never yet been furnished; the fact is, they have nothing to furnish them with. About two months ago the Commissioners wrote to the Trinity House to be supplied with the soundings which the pilot took upon the bar, and that there should be attached to that the rise of the following tide; the only answer they got was referring them to their tide gauge which is at the Low Lights, which only gives the rise of the tide. The diagram is taken off every fourteen days, and it is a very erroneous matter; it has no connexion with the bar at all. Does not know that they ever had one true sounding on the bar. Once got a paper from their chairman; but there were three parts in it that witness totally objected to; the others might have been true, because they could have happened. One gave 26 feet water, one gave 25½, and the other gave 25. Maintains that there never was, since they have been Commissioners, 25 feet on the bar, or yet 26 feet, for, had it been so, the lower part of Shields would have been flooded, 440.—Does not know where the return came from, 441.

PURDO, COMMANDER WILLIAM, R.N.—(*Further Examination.*)—States that they have never had any return respecting the depth of water on the bar, 492.—Had a paper sent to him from a Mr. Henderson, and made some calculations from that, wherein it showed that the bar had deteriorated, 494.—There is an establishment at Newcastle called the Newcastle Trinity Board, 495.—Is not aware that there is a Mr. Henderson connected with it, 496.—Cannot say whether Sunderland, Hartlepool, and other ports are

PURDO, COMMANDER WILLIAM, R.N.—*continued.*

subordinate to this body, but can say from his friends that they complain of being a creek of Newcastle, 497.—The paper received from Mr. Henderson was the subject of a motion before the Commissioners, 498.—It related to records of depths of water kept at the Trinity House prior to the 13th of March 1848, 499.—Brought the paper before the Commissioners at a meeting on the 6th of January 1852, 501.—It was the subject of discussion, 502.—The only document witness had to go by was the document itself, 503.—Made a motion upon the discussion for the purpose of obtaining accurate information, 504.—Has not yet obtained it, 505.—When these returns were applied for from the Trinity House, they sent to say that they could copy them from their tide book at the Low Lighthouse, 506.—At the same meeting concurred in a motion, that, previously to the extension of the jetties at Hebburn Quay, they should receive a series of soundings in the neighbourhood of Hebburn Shoal, the cross sections to be certain sections shown upon Mr. Rennie's and Mr. Calver's plans, 507.—The Commissioners have never received any such soundings, 508.—Was a member of a Committee called the River Line Committee, 509.—Was never summoned to attend upon it, 510, 511.—The full Commission have never approved of any river lines, 512.—Took part in the discussions upon the application of Messrs. Palmer, Brothers, and Messrs. Bowes and Company and Mr. Leslie, for licences affecting that extent of land at the bight near Hebburn Quay, 513. Objected to the licence being granted, 514.—Conceived it the first step to encroachment upon that line of the river, 515.—There are twenty-two piles, which are standing there yet, driven by some miraculous means or other. The Commission went to view the line, but these piles were put, not at Palmer's place, but a little above it, 516.—Points out where the piles were, 517, 518.—There was an application prior to December 1853, 519.—On the 8th December 1853 moved for a return of the encroachments which had been made on the tidal area, 520.—Did not obtain any such return, 521.—Thinks he brought the subject before the Commissioners, from the 9th of December 1853, at each meeting for thirteen works, 522.—The motion was carried by five to six on the 8th of December, 524.—On the 23d of March it was disposed of by a counter motion, 526.—Mr. Rayne, one of the members of the Commission, and a member of the Newcastle Trinity House, moved it, 527, 529.—Thinks he objected to it because he said it was of no use to the Commissioners, 530.—Witness made a motion, that with reference to the application of Messrs. Palmer, a return of the quantity of land which was applied for, or which would be affected by the grant, should be given, 531.—Thinks it was eight or ten months before he obtained it, 532, 533.—Concurred in the motion circulated on the 5th of November 1853 in a circular signed "John Clayton, Clerk," 534–536.—The motion was carried. Thinks a letter was addressed to Messrs. Bowes on the subject, 537.—They concurred in it, but unwillingly, 538–540.—The matter of the piles referred to by witness was not the subject of a motion, 541.—The Commissioners came and viewed the place, and saw the piles there; cannot remember what they said on the subject. The piles are standing there now, 542.—Does not know that the Commissioners directly or indirectly ever gave authority for their insertion, 543.—Remembers a motion being made for increasing the number and lengths of the jetties in the neighbourhood of Jarrow Quay, 544.—Thinks it was lost by a majority of one, 545.—Contrary to that motion the jetties were increased, 546, 547.—Two new jetties were made at the lower part of Hebburn Quay, and two others on the same side in Bill Reach were lengthened, 548.—Points them out, 549.—Thinks the one was increased 100 feet and the other about 70, 551.—Has invariably objected to the ballast being landed between low and high water mark, 554.—Thinks that in some of their discussions on the subject of the jetties and groins, on the 27th of January and on the 8th of December, the engineer distinctly stated that it was his intention to make land along that shore, and that the corporation of Newcastle (when conservators of the river) had consented to make land along the south shore, in order to indemnify Mr. Brown for injury done to his works, 555.—Thinks Mr. Brooks made a report in 1852, stating that between Dent's Hole and Shields there was no less than seventeen feet water; that any ship of seventeen feet water could navigate it; and that he shortly expected to make it up to eighteen, 556.—The first time they had an opportunity of testing the fact was, with the Sardinian frigate; she was wanted to go down, and they had to reduce her to sixteen feet water; had the depth of water been as stated by the engineer, there would have been no occasion for them to spend 700*l.* in dredging before she could get down the river, 557.—Witness made a motion for sections showing the depth of water in the river from the bar upwards; thinks the engineer volunteered to give those sections to Newcastle, 558.—The Commissioners have never received them, 559.—There are three or four post-marks in various parts of the river, but does not know to what level or what standard, 560.—Cannot recollect having had any records of tidal observations returned to the Commissioners, 561.—He has been as constant an attendant as anybody at the meetings of the board. 562.—Thinks the board has not worked efficiently, 563.—It is hardly possible that a river which is managed by a pure local conservancy, situated as the parties are on this river, can be worked for the good of the public in general, 564.—In such an extensive trade as is carried on in this river there ought to be some higher and more ruling power than the locality will afford, 565.—Spoke of bringing forward a motion some thirteen times within the space of thirteen weeks, 566.—The answer received was so vague and unsatisfactory, that witness saw very clearly there was no intention of giving it, 567.—Saw that on each motion, 568.—Took the opinions of Mr. Rennie and Mr. Rendel as being the specific engineers who had been called in, 569.—As a general principle, considers any departure from their recommendation as suicidal, 570.—Considers that the principles of Mr. Rennie and Mr. Rendel are perfectly reciprocal so far as the river line goes, but not as to the bar, 571.—With regard to the encroachments, they are perfectly agreed, with this difference: Mr. Rendell totally prohibits cross jetties, while the other admits them, 572.—It makes a very wide difference in the principle in favour of Mr. Rendel, 573.—Mr. Rendel omits the jetties, but Mr. Rennie supplies half-tide transverse jetties, 574.—Mr. Brooks advocates the full-tide jetty, and Mr. Rennie the half-tide. When Mr. Brooks joined the Commission he had no idea of a training wall at all; Mr. Rennie had, 576.—Has never but once had any soundings supplied from the chairman, 577.—Thinks he (witness) made three motions on that subject, 578.—Thinks the motion was for a return from the harbour master in one instance, 579.—The chairman did not consent to his having it, 580.—The chairman furnished a set of soundings wherein there were 26 feet and 25 feet water given, which witness knew to be wrong, 581.—Went with the pilots to see the method in which they did it, and saw that it was correct and very well done, and that they took the rise of water afterwards, 582.—If there were 26 feet above the bar a great many of the cellars of Shields would be full of water, 583.—Knew very well at the time that the bar was not deepened, 584.—About that time it was 22 feet water upon the bar; took very good care to ascertain after that what the water was, 585.—Came over from Shields the very following spring tides and went to the harbour master's office, and there measured the tide, and ascertained from the best experienced men in the place what the water would be on the bar, and saw very clearly that had it flowed 26 feet it would have flowed into the room, 589.—Does not recollect being summoned to attend the River Line Committee, 590.—Thinks they put him off the Committee last year, but does not know whether he is on at this time, 591.—Remembers instructions being given to Mr. Brooks from to time for several months to furnish a report to the Commission, 592, 593.—Thinks Mr. Brooks brought forward a paper two or three meetings ago, to say that it was in progress. Has not seen it yet, 594, 595.—The piles spoken of by witness were driven between the staith that was put out, 596.—They had no connexion with the staith. They were driven between the point that Mr. Palmer was allowed to carry his jetty to and the point that Mr. Bowes carried his jetty to, without having a licence for it, 597.—Does not know what they driven for, but believes they were driven by the Commissioners' pile driver, 598.—Does not know who gave them leave to get the pile driver, 599.—Did not agree with the motion that was made to increase the number of groins at Hebburn, 600.—The Commissioners were very much impressed about these groins, and the water was very

PURDO, COMMANDER WILLIAM, R.N.—*continued.*

shoal; the engineer advised, and also some of the parties, that if they were tried, they would be tried as an experiment. Consented to that as an experiment, though very reluctantly, and a report was to be made of their efficacy. That report has never been made yet. The groins are still there, and subsequently to that time the engineer has stated publicly that he intends to make land between those groins, 601.—Only comes here once a month, when summoned, 603.—Comes and attends the meeting, and goes back to Sunderland, 604.—Examines the state of things in the river as often as anyone, 605.—Has seen Mr. Brooks sound, but puts no faith in his soundings, because he cannot tell any data, 606–608.—Does not understand the levels at all, 609.—Mr. Brooks has endeavoured to explain to witness the meaning of these posts, but not satisfactorily, 610.—The datum of the port is 15 feet, 611.—Does not mean to say that Mr. Brooks' report in 1852, when he said that there were 17 feet of water was incorrect then, 613.—The draught of the Sardinian frigate was 16 feet, 614, 615.—Some months afterwards the frigate went down, and if the water had remained as before, the ship would have gone down without dredging, 616.—Can take a vessel down this river within a few inches of the draught, 617.—She was a vessel worth about 60,000*l.*; if it had been 600,000*l.* witness should have taken her, 618.—Was never connected with the Sunderland Colliery, or with any other works in Sunderland, 619.—Became a sailing-master in the navy, 620.—And then master attendant and Queen's harbour-master at Chatham, and then at Portsmouth, which duties he executed for 11 years, to the satisfaction of his superiors, 621.—And then retired upon the pay of a commander, 622.—Considered that the abstractions had been so enormous from this river when the application was made for those docks to be made, that it would not be either honest or just to admit of such an abstraction, or of such a dock being made there, which would occasion the silting up of the whole slake, before most seriously considering the consequence that would arise from the abstraction of such enormous quantities of water, which both Hay Hole Dock and all that south shore would abstract from the river, and, therefore, he considered that it was his duty to endeavour to get that information before he gave his consent to anything being done in Jarrow Slake, 623.—Has no objection to docks in the river. Is a friend to docks in every way, but not out of the river, 624.—The object in writing that letter to Sir James Graham was to get those docks put into such a shape that they would not occasion the abstraction of the slake from the river, 625.—Never used these words, "If I had got Mr. Rendel's tidal diagram Jarrow docks would never have been made;" but did say that if that return had been given, the Committee of the House of Commons would have paused before they gave the Jarrow dock in the shape they have given it, 627–630.—There are in the appendix to Mr. Rendel's report very elaborate diagrams, 631.—Never saw them but once, in the engineer's room, where there is no room to spread them out, 632.—Has never seen them referred to by the Commissioners, 633.—Agreed with the Admiralty in thinking that there should be compensation for the water abstracted, but went far beyond that. Thinks the Admiralty was most lenient to them in that view, because, in 1847, when the docks were projected, Mr. Walker said that the engineer ought to take special care that excavations should be made for a compensation for the dock, which was only to take up 60 or 70 acres, whereas now they will not accede to any compensation at all, 634.—Knows very well that the bar has had rarely more than 24 feet water since they have been in the Commission, 635.—There is no sediment running into Portsmouth Harbour; it is dependent for its existence upon tidal water only, 636, 637.—The Tyne is a mixture of a powerful river and a limited estuary, 638.—The estuary is comparatively small as compared with Portsmouth Harbour, 639.—The supply of fresh water coming down the Medway is very small, 640.—There is a good deal of land water coming down the Medway sometimes, 641.—Admits that Portsmouth is exactly the difference between an estuary into which the sea flows, and from which the sea ebbs, which is dependent for its existence upon tidal water only, and an inlet into which a powerful river flows, which is dependent for its existence upon a combination of the land floods and the tidal water, but this River Tyne is a mixture. Conceives that the River Tyne is kept open by the land water above Newcastle, but the tidal water is its main and principal support from Newcastle downwards, especially from Bill Point. Before the encroachments on this river, conceives the estuary here was much larger than at Portsmouth, 642.—In the case of this river, there is a bar at its mouth, and a tide running at right angles to it, and the mouth is between 400 and 500 feet wide. Conceives that the water is excluded to an extent that, when all that is in those places is made into land, there will be a mischief arising at the bar which will become irremediable, 645.—Made some motions with a view of getting a return from the Trinity House with respect to the soundings over the bar, 646.—The answer was, they could make copies by sending for them. Could not have had the soundings upon the bar, because they did not take them. Could only have had copies from their diagrams of the rise and fall of the tides, 647.—Applied for a return of the tide on the bar, which was refused, 648–650.—States that they had no tidal reports from their engineer, 651.—Witness has no specific case where he made official application, further than what he had done direct in the Commission, 652.

QUARRYING:

Some quarrying is done at the Trow Rocks, *Walker*, 4489.

QUAY OR GROIN:

Was in progress at Willington when witness entered upon his duties of engineer to the consevators, and the effect of that was greatly to change the channel or shoal in the neighbourhood of Hay Hole; and if that work had been perservered in, and Mr. Rennie's lines had been strictly abided by, the result would have been the entire closing up of the Hay Hole Channel, *Brooks*, 1983.

RENDEL, JAMES MEADOWS, Esq. (*Analysis of his Evidence.*)—Has been consulted upon a good many of the navigations and estuaries of the United Kingdom, 3927.—Was consulted in August 1848, by the corporation of Newcastle, then the conservators, on the state of the Tyne, 3928.—An inquiry by Captain Washington, and other inquiries were given him at the time he went down, and had all the results of those inquiries before him, 3929.—Gave evidence in the House of Commons in 1849 in opposition to the Shields Conservancy Bill; has repeatedly given evidence there upon Tyne matters, 3930, 3931.—Has given evidence so often upon the questions of the Tyne, that he fears he may confuse the evidence given upon one Bill with that given upon another, 3932.—Was engaged in making a very elaborate survey, 3933.—Has no copy here of his report dated 11th October 1851. Is perfectly familiar with the whole question of the improvement of the Tyne, and, as a whole, can answer any questions; but if the object is to inquire into his connexion with it at various times and before various Committees of Parliament, he must have some documents to refer to as to dates and circumstances which induced the evidence given. He is satisfied that nothing he has said or done will be inconsistent with the views he entertained from the moment he had an opportunity, by Mr. Comrie's elaborate investigation, of deciding upon what was best for the Tyne as a whole. If questioned as to the state of the river now, as contrasted with its condition at another time, witnes must make a careful comparison of the charts made by him with respect to the general character of the Tyne, and what he regards to be the proper mode of of treating it. His report contains his opinions as to what he thought best for the Tyne as a whole. He draws that broad distinction, and without some new facts are brought to his knowledge as to alterations in the set of the tides, or changes that have taken place in the mouth of the river, or other circumstances of that nature, he could not, if examined for a week, say more on the subject than will be found in his report, 3934.—That report was made after three years investigation; he represented to the Commissioners that the questions referred to him were so complicated that no engineer ought to report as to what was best for the Tyne without most minute, careful, and deliberate investigation, 3935.—Thinks the lower part of the river ought to be first put into a condition of improvement; believes there is no difference of opinion upon that, 3936, 3937.—Thinks the estuary up to, or about Bill Point, and the part above, the one being

RENDEL, JAMES MEADOWS—*continued.*

the estuary and the other the river, might be taken as a fair division, looking to the order of precedence in constructing the works, 3938.—The report further says, "The first work set in hand should be the South pier," 3939.—His reason for advising this was to get the tide as early as possible upon the young flood into the river. Believes one of the great causes of an insufficient tidal flow up the river is the way in which the tide comes into the harbour with reference to the Tynemouth headland, 3940.—As it appears decided that witness is only to be examined on those points relating to the banks of the Tyne, and the alleged encroachments made by embankments, jetties, and other works, hs is sure he can be of no use to the Commissioners, as no engineer would say that this or that plan was best for the improvement of the navigable channel of the Tyne inland without previously knowing what was to be the nature of the piers at its mouth. Has only his private document connected with the Tyne; sent all others back with the appendix to his report, 3941.

RENDEL, JAMES MEADOWS, Esq. (*Further Examined.*)—Assuming that piers such as Mr. Walker has recommended are constructed, the bar is within those piers; so it is marked, 3942.—Thinks it is important that the tide should be directed into the harbour's mouth as early as possible, or simultaneously with its set along the coast at Tynemouth Head, and that everything should be done up the river to accelerate the tidal wave so as to induce it to rise upon itself as it advances up the Tyne. It appears, having reference to the short distance between the coast and Newcastle, that there is an undue delay in the arrival of the tidal wave up to Newcastle, which is a strong indication of obstructions at the harbour's mouth, and of impediments in the river. This is strongly marked in the diagrams accompanying witness's Appendix. Excepting under extreme circumstances, the tide does not rise so high in level at Newcastle Quay as it does at sea; therefore every arrangement of works at the mouth of the Tyne which does not go directly to the earlier propagation and the acceleration of the waves up the river, thereby increasing its momentum, and consequently its volume at Newcastle, is bad, 3943.—Is speaking as to the effects of the works on the set of the tide into the mouth of the river on the early flood. The size of entrance between the piers is 1,100 feet; it is large enough if they can maintain it, 3944, 3945.—The bar marked here is considarably within the piers, 3946.—Was examined on the Tynemouth Dock, on the 26th of April 1853, before Mr. Hawkshaw, the surveying officer, at the instance of Mr. Clayton, the clerk to the Commissioners, in opposition to that dock, 3948, 3949,—Does not know whether that dock was opposed by the Conservancy Commissioners, 3950.—Those docks were part of a system in connexion with two guiding piers, essential for removing the sand from the bar. It is absolutely necessary to the proper propagation of the tide up the river that a considerable length of the channel at the Narrows should be minutely defined and fixed, and witness laid his works out accordingly. Any docks constructed north of the northern or south of the southern guiding pier will be no disadvantage to the navigation, if there be beach enough left to the eastward for the sea to break itself upon, 3951.—Remembers being examined on Mr. Walker's inquiry, 30th of March 1852, 3952.—Thinks that inner piers are essential for the improvement of the harbour, 3953.—Believes it to be an essential part of any plan to build guiding piers at the Narrows; because, looking to the changing character of the channel along the Herd Sand, without a long column of water in a straight direction between the entrance on the Herd Sand and the broad expanse of Shields harbour, the Insand can never be got rid of; nor can a uniform depth of channel between the Narrows and the bar be maintained, which is essential. The remarkable disparity of depth in the short distance between the Narrows, off the Middens, and at the nine-feet bar, is the best evidence of the malformation in the water channel at present, 3954.—This state of things is connected with the way in which the flood tide enters the river; with the loose banks of sand, which constitute Herd Sand and the shores at the Narrows; and further, with the tendency which the flood tide has to follow the course of the ebb tide, instead of making a straight channel through the Insand, evils which those guiding piers would materially remedy, 3955.—The position and length of those

RENDEL, JAMES MEADOWS—*continued.*

piers are materially connected with the direction of the flood tide, 3956.—According to the current lines laid down in Giles's survey of 1813, the Commissioners will find that the tide coming up from the northward overruns the harbour's mouth, owing to the projection of the Tynemouth headland, so that the harbour is partly filled by a back stream, wheeling over the low part of the Herd Sand, as well as into the entrance. In all entrances of this sort there will be ebb tide passing out of the river while there is flood tide along the coast; consequently, until the tide is high enough to overcome the stream from the harbour, the stream of tide is not propagated up the harbour. On the contrary, where the projecting headland is on the opposite side to that along which the tide comes, acting as a groin to throw the tide earlier into the harbour, he does not know a case of a bad bar. Gives several cases. When the wave is properly propagated and accelerated, the tide in an estuary will rise above itself, of course not to the same extent, if it meets with impediments, 3957.—If Tynemouth Head were carried a mile further to sea, witness believes that the the Herd Sand would follow it. It is the result of the strong eddy formed by that headland, 3958.—Is also of opinion that the Spar Hawk is a northern extension of the bar, consequent upon the stream of flood being thrown off by the Tynemouth headland, 3959.—The Tay is a parallel case as regards the headland being on the north, and the stream coming from the north. At Montrose the reverse is the case; there is a large accumulation of sand and gravel on the north, the headland being on the south. The tide comes from the north, and is thrown into the harbour, and there is the phenomenon of an estuary without a bar, 3960.—This Tynemouth head, being a great groin, causes the flood tide to overrun the harbour's mouth; therefore it will rise faster outside the mouth than it does up the harbour, and then a rise takes place over the low part of the Herd Sand, and hence what is called the "wheel," which makes the nine feet bar on one side of the Narrows, and the Insand on the other side, 3961, 3962.—Considers inner piers essential for the improvement of the harbour. It is bad engineering to make parallel piers running the whole way from the entrance to the Narrows, because whilst propagating the tidal wave, they will also facilitate the in-run of the sea. The inner piers will direct the tidal current to and from Shields harbour in a straight course from the sea entrance, whilst the sea will break on the sloping shore left open between them and the entrance. A serious difficulty in Shields harbour is the Insand and the Durtweek Sand, both arising from distortions in the flood and ebb tide. Comparing the soundings taken in 1849 with those made the other day by Mr. Comrie, finds an increase of depth between the Narrows and the bar, but considerably more on the south side of the channel than on the north. Consequently the spit of the Insand has grown up northward, and thrown the flood tide more along the lower part of the North Shields shore. That has produced the deflection of the current from that shore to the south shore, and Durtwick Sand has grown up eastward, and the bandying about of the stream from one side to the other at the Narrows and through Shields harbour causes frequent changes in the condition of the Insand and Durtwick Sand. A stream cannot be knocked from side to side without corresponding eddies, banks, and deep holes. The result is, necessarily, a malformation of the channel, 3963.—The mooring of ships in Shields harbour produces a considerable amount of stream and scour; if they are removed into docks there becomes a greater necessity to be mindful of what is done at the Narrows; a greater number and distortion of banks will be found than now exist, 3964.—Whatever obstructs the free current of a river must affect its bottom and sides. Vessels may be moored so as to block up both sides of the harbour, and so reduce the section of the channel, as to force the whole stream of tide to pass between those moorings; in such a case there must be a variable channel. One of the properties of a good harbour is to have a permanent bed and shores, 3965.—If there are no inner piers apprehends the effect of the flood tide admitted between openings of that kind, as shown upon the plan before him, will be that the stream will be irregular and languid between strictures from that part up to the Narrows, 3966.—Denies the possibility of making this large space within the piers a harbour of refuge. It can never be kept with any depth of water. It is larger than necessary to destroy

RENDEL, JAMES MEADOWS—*continued.*

any waves that enter between the pier heads; and not having any guiding lines for the tide through this enormous space, it will become filled with sandbanks, very irregular in form and depth, and without any fixed line of channel, unless parallel walls are built for a considerable distance between the Narrows and the sea entrance, so as to give a direct course to the stream. Refers to what is taking place at Liverpool, 3967.—Has no objection to a north shore pier, if the south shore pier is extended sufficiently beyond it, 3968.—The extension of the walls on the Mersey on the Lancashire shore gives a greater rise of tide into the Mersey, 3969.—If the south pier were indefinitely extended so as to catch the tidal flow in the Tyne the case would be analogous to the Lancashire shore, and the set of the tide there, 3970, 3971.—At present the mouth of the Tyne must be regarded as extending from this rock opposite the Tynemouth barracks to the Herd Sand, near the Narrows, for this reason, that immediately the tide flows over the lower part of these sands it not only flows up the deep channel, but also by the "wheel" stream over this sand, which is one of the causes of the maintenance of the channel. If this large space be enclosed, and at the same time the "wheel" stream destroyed by one of the piers, there would be a diversity of channels between the sea entrance and the Narrows, and these deeps will be diminished, and perhaps split into several parts; the mouth of the harbour would beat perfectly right angles to the coast stream of tide, and there would be no fair run into the harbour. If these piers were built as here laid down, the tide in running across their heads would form a bar from the north pier, which would cause the stream to enter in a direction that would produce eddies and banks within the pier-heads, 3972. —Thinks that any piers at the mouth of the Tyne which did not give a straight course for the stream of tide in and out of Shields harbour would be positive evils. The worst consequences may be expected, 3973. —In the scheme for the Tynemouth Docks, which was opposed by the Commissioners in 1853, witness said that if the docks were confined within these guiding piers, which should so far overrun the docks eastward as to leave a sufficient portion of the shore unenclosed for the sea to break upon, he saw no objection to it in an engineering point of view, and thought it a desirable thing to promote the trade of the port by allowing such works to be constructed when they did not interfere with the navigation, 3974.—Remembers giving an opinion that the Dock Company ought not to have their Act unless they built, as a portion of their work, those piers, paying part of the cost, 3975. — Again repeats that it would be improper to allow docks to be begun outside the Narrows unless made in conformity with guiding piers, as laid down, for the reasons before given, 3976.—In the plan accompanying witness's report of 1851, thinks he left Shields harbour very much in the state in which he found it, considering that until docks were made to take the shipping out of the harbour it would be bad policy to contract its area, 3977.—There was a scheme for a North Shields Quay in the spring of 1851, 3978, 3979.— Had not then made his report to the Tyne Commissioners, but was acting as their engineer, and had the whole scheme of river and entrance improvement under his consideration, as afterwards reported upon, 3980, 3981.—Plans for a pier by the Shields party were then referred to him by the then conservators of the river, 3982.—Does not know that his report was in opposition to the plan which the parties were afterwards obliged to accept from the Tyne Commissioners, but it will speak for itself, 3984.—Does not know that the plan which was sanctioned was half in length what witness approved, 3985, 3986.—Knew the importance of the Tyne, and felt that a few years hence those who meddled with it would have a good or bad name for engineering skill in such matters. Took three years to investigate most carefully the matter referred to him, and reported the result, 3987.—Was examined before Mr. Walker upon the piers and upon Hay Hole Dock, 3988.—Made a report, dated Nov. 1851. No doubt that shown him is a copy of it. Made a report upon those three subjects, 3989.—In his report of October 1851 recommended how the coal staiths at Hay Hole ought to be dealt with, 3990.—The principle he advocated for the treatment of the river was this, not to take any more tidal water from the Tyne than was absolutely necessary to constitute a good sailing channel up to Newcastle, and especially pending any works at the entrance to the harbour, 3991.—As far as

RENDEL, JAMES MEADOWS—*continued.*

the staiths were concerned, thought that a half-tide dock was better for the owners than extending them to the new channel, or the necessary half-tide wall. It was a question between paying compensation to the parties who had erected them, and the expenditure of that sum in works for improving that part of the river, and adding facilities for shipping coals at those staiths. The plan was a good compromise. The greater liability of its silting as a half-tide dock than as a whole-tide dock did not appear to justify the adoption of the latter, and the consequent loss of so much tidal water; considered that as Jarrow Slake, which is a half-tide sheet of water, has not all silted up since the survey of 1813; that this half-tide dock on the opposite side of the river could not have its deep channel along the line of staiths materially shallowed for many years to come, 3993.—To prevent the unnecessary loss of backwater, the proposed half-tide training banks for the navigable channel are superior to the whole tide groins now in use upon the Tyne, the latter occasioning the rapid formation of land between them, but the former by leaving the shore liable to the shore tides from half flood to half ebb, preventing, as in Jarrow Slake, such formation, while the opening proposed to be left in these banks ensure safe and easy access to the existing wharfs. Begs to state that unless some new fact is shown him, or that Mr. Giles' and Mr. Comrie's surveys were wrong, he cannot alter one word of his report, 3994.—Again repeats, that in the treatment of the Tyne for conservancy purposes, it ought to be done by half-tide training banks and not by full-tide walls, making solid land. Would not trench upon the receptacle of the tide so as materially to diminish its volume. The only grounds upon which it may be justifiably diminished is, that the navigation up to Newcastle cannot at a justifiable expense be made good without risk of some reduction, and the same with regard to the existing waterside establishments between Shields and Newcastle. If works are made up the river for its improvement, without reference to the natural difficulties which exist at its entrance, the consequences will be most fatal, and hence the necessity of a strict conformity to some well-devised plan for the whole river and its entrance, 3995.—The navigable channel up to Newcastle should be got with the least possible sacrifice of the tidal water, especially pending the result of any intended works at the entrance, 3996.— There should be compulsory powers over the frontages and the landowners, 3997.—In the plan accompanying his report showed half-tide training walls, 3998.—And also openings through them in certain places to give access to property situated on the present shores, and to do that in a manner that would ensure a gulley or deep channel out of the navigable channel between beacon heads, the effect of which would be to lessen the tendency of the shore to silt up, 3999.—Knows Mr. Rennie's report. He being a shrewd and experienced engineer, no doubt his object, by means of half-tide training walls, was to make nature help him in the attainment of his object, 4001.—The Clyde is not a parallel case to the Tyne, 4002.—The Clyde has no sea bar nor cross tide, 4003.—For nine miles below Glasgow it is only from about 200 to 350 feet wide; its channel, which is comparatively straight, has been made deep by dredging, and is now maintained chiefly by the flood waters of the river. The rise and fall of the tide in this channel being only about half that due to the Tyne, the tidal backwater is comparatively of little value in maintaining the navigation up to Glasgow; and as there is no sea bar or tidal stream across the outfall of the river, the necessity for a large volume of tidal water, as is the case in the Tyne, does not exist in the Clyde. The latter, though it receives tidal water, is of such a contracted capacity as to be maintained by land floods and dredging. No doubt the Tyne may be embanked from Newcastle to Shields as the Clyde is from Glasgow to Douglas, and, with the aid of dredging, probably with the same results; but the form of the coast or the cross course of the tidal stream cannot be changed into the converging shores of the Clyde, nor can the tide be made to run true up and down it. Hence the difference of the two rivers, and the necessity for their different treatment, 4004.— In the Clyde nearly all goes up by steam-tugs, 4005.— If it were necessary to deepen the Clyde still more by dredging, has no doubt its land waters would maintain it, but the case is not so as regards the entrance to the Tyne, 4006.—The trade on the Clyde almost all goes on by steam, 4007.—In the Tyne a sailing channel is of importance, as vessels employed in the coal trade

RENDEL, JAMES MEADOWS—*continued.*

cannot pay unnecessary expenses, 4008.—The maintenance of Shields harbour is almost entirely dependent on the opertion of the tidal flow, 4009.—Draws a great distinction between the estuary up to Bill Point and the river above Bill Point, 4010.—The estuary of the Tyne depends upon the tidal water, and the upper river upon the land waters; and if it depended entirely upon the land water, doubts very much whether it would not for half the year pass off through Herd Sand by filtrations instead of having a navigable channel, 4011.—It is possible to have a deep canal between Shields and Newcastle, and no definite sea entrance, 4012.—Was examined before the Tidal Harbour Commissioners in 1845, and has no reason to differ from the opinions he then expressed, 4013–4017.—This is the first time witness has seen Mr. Walker's plan, 4018. —Was not aware that the Commissioners of the Tyne had decided upon adopting the suggestion of Mr. Walker, "that the question of inner piers should be left till the others were built," but should have been of the same opinion. Holds it requisite to have a long line of guiding walls; and to put in a short length in one side seems like resorting to an experiment to prove a failure, 4019, 4020.—Speaking of walls with relation to the piers means full-tide walls, to keep up a uniform velocity in the tidal column for its whole period of flood and ebb, and thereby increase the quantity of water passing up and down the river, 4021, 4022.—Does not remember reporting upon the works at Belfast Lough in May 1845, 4023.—Witness has some recollection of a report relative to a railway scheme, 4024.—Still adheres to the extract just read from witness's report on Belfast harbour, because it is a totally different case from the Tyne, 4025.—Belfast is a tidal estuary, but has no resemblance to the estuary of the Tyne, 4026.—Has heard that Tynemouth Dock Bill was thrown out by the Committee of the House of Commons on the evidence of the promoters. All witness did upon the matter was to give evidence before Mr. Hawkshaw at the instance of Mr. Clayton, 4027, 4028.—Does not believe that Mr. Rennie recommends half-tide walls, but half-tide groins, 4029.—Comparing the question of the quantity of water with the velocity of the water, is of opinion that that is the more important which makes the greatest scour upon the bottom, 4030.—As far as Newcastle is concerned, whatever works depress low water and raise high water, that is, increase the column of the tide, are evidence of improvement, 4031.—Witness would readily sacrifice a large quantity of tidal water near the mouth of such a river, in order to get a comparatively small increase higher up the estuary, 4032.—Does not agree with Mr. Walker, "that if a river depends upon land "floods, the abstraction of tidal water is of little im- "portance compared with the proper regulating the "stream," as a general principle, nor does not think Mr. Walker would say so as a general principle applicable to all cases, 4033.—Was examined in 1849 before the Committee upon the River Tyne Conservancy Bill, 4034.—The extract just read from witness's opinion given in 1849 must have been under some very special case, 4035.—Reading detached passages from a long evidence is anything but satisfactory when truth is the object, 4036.—Witness sees that something like a contradiction is attempted to be set up, and asks as a favour to be allowed to see if there is any inconsistency in his former evidence with the present. When urged repeatedly by the Tyne Commissioners to give them his opinion on questions of this kind, declined doing so until he could go into the case as a whole from Newcastle to the sea, therefore it is unlikely he should commit himself to an opinion of this sort, except with reference to some speciality, 4037.—Witness said that most things go up the Clyde by steam tugs, 4038.—Supposes that one of the great objects of laying out so much money in the Tyne, is that fewer steam tugs need be used, 4039.—Supposes there is no difference of opinion among the gentlemen at the table that if a good sailing channel could be made they would not go to the expense of steam tugging, 4040,—If a vessel can go up in one tide with her sails, it must be cheaper than steam tugging, 4041.—Witness's opinion is that Newcastle cannot be in a good condition when Shields is in a bad one, as far as navigation goes. Thinks it most extraordinary that a river second to few in commercial consequence should for so many years remain unimproved, because those so deeply interested cannot agree to accept the plans of a competent professional adviser, 4042.—The river at Newcastle cannot be improved

RENDEL, JAMES MEADOWS—*continued.*

without advancing the interests of Shields, nor can Shields be improved without advantage to Newcastle, but unfortunately the parties down there will never go straight to the object of general improvement, 4043.—Has examined the soundings since he was last here, 4044.—Witness referred to the Durtwick Sands, when he said there was a deep channel in one part of the river, 4045.—Witness does not speak from the result of his own soundings, but from the chart kindly lent to him yesterday. Remarks upon the different soundings, and says that all these changes in so short a time since 1849 are evidences of disease, 4046. —A navigable channel may be 1,000 feet wide, but unless the navigable depth is defined it cannot be determined from that fact that the channel is 1,000 feet wide for a vessel drawing, say 14 feet. Nothing is an improvement that brings down Durtwick Sand and Insand. If the channel is 1,000 feet wider now than in 1849, the state of Durtwick and Insand are evidence that things are going wrong as regards this part of the river, 4047, 4048.—The channel is wider than in 1849, but that does not influence witness's opinion. Has not measured the width, but will do so if the Commissioners like, 4049.—Agrees in the proposition that what is the interest of Shields is the interest of Newcastle, but cannot think it the interest of Shields to have the Durtwick and Insand growing up, 4050.—Witness draws the distinction between Hay Hole Dock and Jarrow Slake. Hay Hole made into a half-tide dock would have, as it has at present, a current passing over its whole extent, as soon as the flood tide covered its enclosure bank up to the time on the ebb when the tide had fallen below the bank. Now Jarrow Slake, without a current passing over its surface, presents no evidence of having silted up since Giles's survey of 1813. It is right to infer that, as its level is that of half-tide, the water in this part of the river does not carry much silt in suspension. This being the case, witness did not consider that silting up would go on at any considerable rate in such a half-tide dock, though, as more tidal water will pass over it than passes over Jarrow Slake, the shelter afforded by its partial enclosure would make any deposits of silt less likely to be removed than similar deposits on the unenclosed surface of Jarrow Slake. Still, as only a small portion of the whole surface of this half-tide dock would be used by the vessels loading at staiths, the remainder of the docks might, without injury, silt up to the level of its half-tide enclosure bank, 4051.—Does not think that a half-tide training wall, only leaving room for the tide to expand itself beyond it, would impede the progress of the tidal wave. If by the construction of proper works at the entrance and at the Narrows the early inset of the tide is secured, with the half-tide training walls would be secured the young flood up to Bill Point in less than three quarters of an hour after the tide begins to make off Tynemouth Head. More than this could not be done by any permissible contraction of the river within whole-tide walls, even omitting all consideration of the effects of loss of tidal backwater on the sea entrance, 4052.—As the half-tide walls would, up to half-tide flood, and after half ebb, confine and direct the stream as completely as whole-tide walls, so far there could be no difference in their effect. What the difference in the velocity would be in the deep water channel if the walls were raised to whole-tide level would mainly depend on whether the sea entrance would pass the requisite quantity of water to fill the larger reservoir due to the half-tide walls system, as compared with the reservoir due to the whole tide wall system, 4053.—Does not think the training walls being above half tide would affect the tidal wave at Newcastle, 4054.—The making a complete closed trough from the Narrows to Bill Point would not materially increase the tidal wave beyond Bill Point, supposing that the bed of the channel has the inclination the land floods will give it, 4055.—The average bed from Jarrow to Newcastle is nearly level, and considers the sands above Jarrow Slake a river bar, that will always require some dredging to enable the river to maintain its proper slope and outfall, 4056. —As an engineer, does not think that five years is enough to test a principle on works of this nature; besides, as a matter of experiment, would wish to see it carried out a little more fully, 4057.—Does not think the results of four or five years, unless very decided, would be safe guides to form an opinion for the future, 4058.—There have been some half-tide training walls made in the river Tyne, the result of which is at present satisfactory, 4060.—In the present state of the

RENDEL, JAMES MEADOW—*continued.*

works on the Tyne there are some specimens of training walls, but the chief works are on the whole-tide groin principle, 4061.—The advantage of training walls as compared with groins is strong, when there are curves in the channel, and consequently difficulties caused by not being able to keep the ebb stream in the same course as the flood. These are witness's reasons for preferring training walls to groins; and his reason for preferring half-tide to whole tide walls is that he does not think it safe, so far as the entrance is concerned, to diminish to such an extent the tidal water, 4062.—Does not look at the groins as the scaffolding, but, unless they are connected by guiding walls, as means of coercing the current and forcing it to pass between their heads, 4063.—Witness's opinion is that as to the propagation of tidal water up the river the result would be nearly the same with half-tide walls or full-tide walls; but the advantage of half-tide walls would be, that by them would be attained all that could be desired in the way of propagating tidal water up the river, without diminishing the quantity to an extent that might endanger the sea entrance of the river, 4064.—There were some calculations witness thinks in the appendix to his report. Directed Mr. Heppel to calculate the area of the then tidal limits, and the cubic contents of the water it contained at a high spring tide, and other calculations, which he gives most fully; he is very accurate in his calculations, 4065, 4066.—After the half-tide training walls have been in operation for some time, does not think the space at the back will remain so deep, 4067.—Thinks that the bursting effect of the tide over the wall would always keep the silt lower than the wall. Witness's impression at that time was, that taking the whole area, or rather the whole cubic capacity of the shores outside the channel made between the half-tide walls, there might ultimately be one third part lost by the silting. This loss would be more than made good by the removal of banks between the half-tide walls in the channel, 4068.—Mr. Brunel's sketch is not a correct diagram of the shores of the Tyne, because it assumes that the slope of the shore at high-water mark dies out. Generally speaking there are cliffs and shipping places on both shores, with a considerable rise of tide in front of them. Witness describes his idea of the form of the shore, and what it would become from the proposed half-tide walls, particularly as these openings proposed to be left in them would give the requisite facilities for vessels to get to the wharfs, which would be cut off by whole-tide walls, and would also promote a scour along the shore, and cause such a stream at the opening as would maintain a good channel up to the wharfs. Does not think there are any appearances in the Tyne to bear out Mr. Brunel's supposition, 4070.—If there were no openings left for traders the slope might adjust itself to the nature of the soil. But it would be a question of exposure, current, and a variety of other causes, 4071.—Thinks that trade might be carried on inside the half-tide walls. Along the Flintshire shore of the River Dee long channels of this kind are maintained across half-tide banks much less favourably circumstanced, and other instances may be adduced, 4072.—Very nearly the whole, if not all, the flood tide runs from north to south across the mouth of the Tyne, 4073.—And the ebb the other way; as soon as the Herd sands are up it is nearly a straight course, 4074.—In order to keep deep water in a harbour in that situation, any projection from the south should be much greater than that from the north. Should carry it as far eastward as possible, 4075.—Sees no necessity for a north pier at present. The south pier should always be extended beyond the north pier, 4076.—Assumes that the ebb tide, continuing after the flood tide has made, produces a strong eddy at the mouth of this harbour, and the water carrying sand there is a deposit, 4077.—By investigating the times of high and low water in the offing, it will be found that there is a difference of two hours, 4078.—The ebb tide does not make much between the Narrows and the bar, otherwise this form (which witness points out on the plan of the Herd Sands and bar and Spar Hawk) could not arise, 4079.—Witness was so strongly impressed with the importance of these questions that he asked the Commissioners to employ Sir Edward Belcher, or some one of equal nautical experience, to investigate the matter. The corporation objected on account of the expense. The best existing evidence will be found on the large chart by Giles, in 1813, which shows that the ebb tide from this harbour is

RENDEL, JAMS MEADOW—*continued.*

carried by the sea flood strongly to the south for a considerable time before it begins to make into the harbour, 4081,—Thinks it will be found by Mr. Comrie's gauge book, that whilst the tide was rising at his gauge in Tynemouth Harbour, it was ebbing at the Narrows, 4083.—Mr. Comrie's currents show that there is a period during which the water is flowing out of the river Tyne at the same time that the water is running from north to south across the mouth; there is a very large chart of it taken in 1813, 4084, 4085.—Montrose and Aberdeen have headlands on the south and the Tay, like the Tyne, projecting on the north side, 4086.—The most marked case witness knows of, which is the opposite of the Tyne, is Montrose, 4088.—Witness states the reasons why the piers, as laid down on that plan, would of necessity make the channel more crooked than it is now, as between the Narrows and the mouth. The great difference in the widths of the space enclosed by these piers, as contrasted with the width between their heads and with the river at the Narrows, would give rise to very variable velocities in the tidal stream, where it is of the utmost importance to its flow up the river that it should be made as uniform as other requirements, as, for instance, the in-run of the sea will permit; such a state of currents will allow of such capricious deposit of sand being brought within the piers as will, it is probable, give rise to separate channels or swashways, and would make necessary in this part of the river the same kind of works as are resorted to in the wide parts above Shields. If a good channel is to be maintained between the pier heads and the Narrows, it must be confined within parallel guiding walls approximating to each other from the entrance to the Narrows, so as to leave no more distance between them than will suffice to prevent the sea, which will pass in at the entrance, running past the Narrows and into Shields Harbour, 4089.

RENDEL, JAMES MEADOWS, Esq.—(*Further Examination.*)—Proceeds to show why, in reasoning in reference to the way in which the tide enters the Tyne, he quoted the river Tay, as also the harbours of Montrose and Aberdeen. The Tay is a striking illustration of what witness referred to on Thursday as the consequence of the flood tide overrunning the entrance from the projection of the headland on the side from which the stream comes. An encroachment is taking place in the Tay, called Moncyforth Sands, which is caused by the wheel stream principally. The same encroachment is taking place in the shore between Tynemouth Head and the Low Lights at North Shields, and from the like cause. As the head of Buddon Ness (to which witness has just been alluding), extends eastward, so the difficulty which the tide will encounter in entering the Tay will increase; the water will enter, more than at present, in a wheel over the Abertay Sands. If the inset of the tide were simply a question of statical pressure, there would be no reason why the current up to Broughty Ferry should not take a straight course, or rather flow in a general stream from the coast tide, converging to the defined deep channel at Broughty Ferry, and the reverse on the ebb tide. All these sands and the whole of this formation show that neither the flood nor the ebb stream so enters the river. The two outfalls are much alike in general character, and the like consequences result therefrom. Thinks the tide coming down from the north, and coming round as a wheel, meets the ebb tide running out for a very small time, and causes the bar to a very limited extent, 4270.—At dead low water this bank shoals, 4271.—At the first of the flood tide, while the water is rising in the offing, there can be no pouring of water over this bank, but there is a very considerable submerged part, 4272.—Has no doubt the time of low water is earlier at the bar than at Broughty Ferry; thinks the difference would not be more than 3 or 4 inches in level; therefore, if it were simply a question of statical pressure outside the harbour's mouth, such a difference of head would very soon be overcome. Is merely using this in illustration of the Tyne, which it closely resembles in all these particulars, 4273.—Witness states that if he were called upon to improve the entrance to the Tay, and to increase the tidal volume up its estuary, he would confine his operations to works over the southern sands, so as to catch the early flood stream and to coerce it in a straight course to the harbour's mouth. Illustrates his meaning by a reference to the charts of Montrose Harbour and Aberdeen Harbour, 4274, 4275.—Witness thinks it is

RENDEL, JAMES MEADOW—*continued.*

better for the Commissioners to appoint some engineer to get out a minute comparison of the surveys than that he should examine them. Has looked over the two lower sheets of Comrie's survey, and finds a difference. There is not any material difference in the sectional area so far as witness has examined the new soundings. The changes he referred to are in the relative positions of the banks and channels, and these changes are mainly confined to the Durtwich Sand, and the Jarrow Sand opposite to Hay Hole, all of which sands appear to be moving more down the river, comparing their positions now with what is shown in the survey of 1849. Witness does not perceive the difference referred to by Mr. Seymour (last Thursday), between witness's evidence given in Parliament in 1849 and in his report of 1851; if there is any difference it is simply the result of this report having been written after he had all the information before him, which he referred to in the evidence of 1849, as necessary to enable an engineer to report, and therefore the evidence of 1849 is not so much to be relied on as the deliberate opinions given in witness's report. There is no kind of analogy between the case of Belfast Lough and the Tyne, 4275, 4276.—It is three years since witness saw the Tyne, 4277.—Did not think that the jetties, embankment, and other works executed and proposed had injured the works up to that time. He found in 1851 that the whole basin within the Narrows would hold at a high tide, taken according to Mr. Comrie's survey, 29,000,000 cubic yards of water, which witness considered was quite sufficient, when properly applied at the bar, to do all the work necessary to make and maintain a good harbour, 4278.—Witness having found many of his notes on the subject, states from them a few of the facts upon which he reasoned before deciding on a plan and making a report, 4279.—The quantity of tidal water in the course of a year passing over the bar on the average of springs and neaps may be taken at 29,200,000,000 cubic yards. The area of the catchment of the Tyne being 1,000 square miles, in round numbers; the quantity of land water passing off at Newcastle is about 1,750,000,000 cubic yards, 4280.—Wells Harbour, to which witness has just referred, is a series of meandering channels, traversing a great extent of flat land covered at high water. Montrose Harbour is a large basin estuary, filled and emptied by a narrow channel to sea, 4281, 4282.—The streams of Wells Harbour are comparatively small, it may be called a tidal receptacle, but it is an entirely different kind of one to Montrose, 4283.—In Wells Harbour there are marshes which the tide overflows, but it is not a parallel case to Montrose or to the Tyne. In speaking of Wells Harbour was only instancing the fact that water running off from half-tide banks into a deep channel between them, promotes a scour on the channel on the margin of such banks, which adds to the maintenance of the channel, 4284–4287.—As a principle, the scouring effect of the water in a river will be greatest when the largest quantity of water is passing with the greatest velocity, but it depends upon a variety of circumstances, 4288.—There will be a slope at low water in Montrose Harbour, supposing the water to be running out up to the time when young flood makes up the harbour. At the least about an inch and a half to a mile, 4289, 4290.—Thinks the more you extend the Tynemouth Headland the further out you will bring the Herd Sand, 4291.—Has always likened Tynemouth Headland to a groin, which, as we know, has the effect of collecting sand on the eddy or opposite side to that from which the stream comes that brings the sand, 4292.—Has no doubt that there is a large quantity of sand moving in and out of the harbour by being taken up by the stream over the Herd Sand, and that much of the sand so taken into the harbour will be brought back by the ebb and redeposited on the Herd Sand. But in all rivers the effect of deposits on the ebb are more observed than those made by the flood, 4293.—As the question is put to witness whether the effect of the flood tide is to put the Herd Sand in a condition of motion, to tear up a portion of it, and to carry that into motion which otherwise the tendency of the deposit on the ebb would be to settle, he must say yes; but the flood tide does not make the Herd Sand, or the ebb tide either; the sand is brought there, not by the river: these sands are the *débris* of the coast brought along by the flood stream and northerly winds, and lodged here from its being a place of rest, protected as it is by the Tynemouth Headland, 4294, 4295.—Supposing the south pier, as at present proposed, is

RENDEL, JAMES MEADOW—*continued.*

arranged, the effect will be to prevent the operation of the flood tide upon the sands within the area circumscribed by the pier. It will destroy the wheel, which is the chief agent which carries the sand from the Herd into Shields harbour, 4296.—When the action of the flood, which has been called the wheel, has ceased, the ebb proceeding to make the same deposits as before, the tendency of the area enclosed by the south pier will be to fill up; and thinking so, witness has the greater objection to the enclosure which is being made. Regards it as a land reclamation instead of making, as it has been said, a harbour of refuge, 4297.—Thinks that that would be the case, though there would be such an amount of inrun of sea through that entrance as would so disturb the sands that it is probable they would be comparatively levelled down over the whole of this space, a great flat sand, having variable channels. Speaks to a very large proportion of the whole, but more particularly to this space within and opposite the entrance, where the stream it causes will end. In the more favourable cases of tidal docks, in all cases banks form in the docks some distance within the gates through which the stream enters the dock, 4298, 4299.—Witness gives his opinion of Mr. Walker's plan. No form that can be given to these piers will prevent the travel of sand along the coast, or stop it from being carried into the entrance with the flood tide. Whilst its current is strong enough to suspend the sand, if the propositions be granted, then it is clear that as the abrupt contraction of the entrance, due to the form of these piers, will give rise to eddy current, both inside and outside of the entrance, sand banks will be formed where these eddies take place. Now if there were to be no more waves, the banks caused by these eddies would be of a shape and kind that might be provided for; but as the sea will continue to break upon these piers when built, and the waves will pass into this wide space between their heads, the sand banks formed, as before described, will be spread out in all directions as a flat bank or shoal, extending probably on the inside, across this wide space, to be enclosed with the piers, and on the outside, as an elongation of the head of the Herd Sand, forming a new bar; nor would the ebb tide, in witness's opinion, be able to check the growth of inner and outer shoals, unless guided and aided in its course between a portion of the two piers made parallel to each other, and by the construction of guiding piers at the Narrows, as in witness's design, 4300, 4301.—These two piers are in effect two vast groins run off from the opposite shores, so as to make a sudden contraction at their heads; the same kind of thing is done up the river in running out groins for the purpose of filling up the spaces on each side of them. Witness contends that that is a bad plan for the improvement of the river channel, as it interferes with the uniformity of the stream of tide, and much more objectionable at the mouth of the river, 4302.—The waves which entered would expand on either side over the area enclosed by those piers, 4304.—Witness explains the principles on which he designed the entrance works in his plan, 4305.—Witness gets all the advantage of the progress of the wave for 1,100 feet in length at the entrance, and has all the advantages from his wide space which Mr. Walker gets from his, 4306.—Thinks there would be a tendency to sand up with flat or level detached banks by Mr. Walker's plan, but not so by his own, 4307.—If Mr. Walker could, but which he cannot, make these banks accumulate so that they would maintain a straight channel between them, from his entrance or pier head up to the Narrows, then he need not coerce the tide in one stream between walls, 4308–4310.—The tendency of the wheel of the tide to tear up the Herd Sand would be checked by the construction of the south pier, 4311, 4312.—That tendency being checked, there would be a greater tendency in the Herd Sand to accumulate from the deposits on the ebb, and from what was brought in on the flood, 4313.—Witness thinks that there would such an inrun of sea, that the sea would bring down the sands and spread them over this wide space in Mr. Walker's plan, therefore does not think that the sands could help in directing the channel of the river, 4314, 4315.—The sea will run in between two piers 1,000 feet in width; there will be a very heavy run of sea along that pier in north-east gales, 4316.—The tendency of the ebb after the Herd Sand is bare is to set to north-east, 4319.—The reason why it is not so before is because the early flood passes off on the covered portion of the Herd Sand, as well as along the deep channel, 4318.—The set of the ebb outside Tynemouth Head is northwards,

but across the Herd Sand it is eastward, and off Tynemouth Head north-east, 4320.—The northward tendency of the ebb, when it gets out of the mouth of the river, is not checked to any appreciable extent by the rocky shore abreast of the Spanish Batteries; thinks it is more checked by the bar, 4321.—Looks to the south pier for the effect upon the set of the ebb, 4322,—Neither witness's nor Mr. Walker's north pier would give any shelter to vessels making for the harbour in north-easterly gales. Witness's north pier would lessen the amount of broken water at the entrance, but Mr. Walker's would gather the sea at his entrance. Thinks there is no site for a harbour of refuge at the mouth of the Tyne, 4323.—Witness attributes the formation of the nine feet bar to which he referred in his evidence to the wheel; there is a large quantity of water passing into the Tyne on the land side of the nine-feet bar; and the stream so passing into the main channel forms, by the circular motion which it obtains, an eddy between it and the sea bar, and the nine-feet bar is the result of this eddy, 4325, —It is stated that since some portion of the bank of the Stones has been removed, there has been a truer set of the ebb current there, and the nine-feet bar is diminished. Witness can understand the lessening of this bar by increasing the power of the ebb tide after the Herd Sands are up, and sees how the removal of "the Stones" will cause such increase, but doubts whether the deposit of a bank in this part of the channel can be prevented whilst the wheel stream is in force, 4329.—The Insand is caused by the ebb stream through Shields harbour, setting first along the west end of the South Shields shore, and then crossing over to the east end of North Shields shore, whilst the strong flood stream from the Narrows sets upon the east end of the South Shields shore, but is incapable of breaking through this insand, owing to the loss of velocity in passing so suddenly from the Narrows into the wide expanse of Shields harbour. The inner piers in witness's plan would tend to correct this evil. This insand is formed in the same way as banks will be formed within Mr. Walker's new piers, 4330, 4331.—The outer part of the Herd Sand is covered at a very early time of flood; when witness was last there the head of it was very flat; a large portion of it is submerged and connected with the sea bar, 4332.—Thinks it would be incorrect, on assumptions that are made as to the effect of these two piers of Mr. Walker's, if constructed, to assume that there would be a distinct channel, and that the Herd Sand would not be covered excepting at a late period of the flood, 4333.—In viewing the question of the effect of these piers for the entrance of water by statical pressure only, it must be assumed that from a very early period of the flood the Herd Sands would be covered, 4334.—Cannot imagine any formation of piers more calculated to promote a deposit of sand within them than the form of those piers, and that at the very mouth of the harbour, 4336.—Thinks this tendency to deposit the sand within would directly affect the quantity of tidal water going up, 4337.—Thinks the bar would re-form outside these pier heads, and that in time it would seriously affect the harbour, 4338.—Having regard to the position in which this entrance would be, assuming such piers constructed, has no doubt that such a bar would be formed, 4339. —Thinks there would be the formation of a bar which would obstruct the entrance of tidal water quite independently of the obstruction which the deposit over these Herd Sands would occasion, and such as would cause a breaking sea also, 4340.—Thinks the bar would be carried with those piers, and, in this position, it would interfere with the navigation, and with the quantity of water passing up and down the Tyne; strongly objects to a north pier if connected with the land. In the plan which witness proposed, the north-east seas would be caught at the back of the north pier, and the broken water would be thereby thrown up the rocks of the Tynemouth Head. By this plan of pier the sea will run along it and add to the broken water, which, if a new bar is formed, will be occasioned by it at the entrance, which will increase the difficulties, and lessen the time each tide that vessels can pass to or from the harbour, 4341.—Thinks the south pier would be somewhat analogous to the natural state of things at Montrose, 4343.—If these piers were constructed, thinks they would form a sand trap rather than a navigable channel or a harbour of refuge, 4344–4347,— In witness's opinion, if the upper part of the channel is to be contracted to the extent to which he has referred, there must be an exclusion of tidal water. He

gave credit to the channel so formed for the whole tidal column going up to Newcastle, 4349.—Witness would not allow the exclusion of tidal water to any extent, until he had so far advanced his works at the entrance as to prove that it might be permitted, 4350. —Witness found by the survey of Comrie in 1849 that the spring tides did not rise at Newcastle to the same height in level as at the low lights by about five inches, Giles having stated upon his plan in 1813 that the spring tides, uninfluenced by wind, flowed level throughout the whole length of the river to Newcastle quays, 4251, 4352.—Between the years 1813 and 1849 there had been a reduction of the tidal area to an extent of nearly 60 acres, but does not think that reduction had anything to do with the difference of tidal flow, 4353.—Thinks the tidal area might be reduced to such an extent that there would be a less flow of necessity at Newcastle, 4354.—As an abstract question, approves of the principle of cutting off bulbs from the river, but there must be a limit to the cutting off of bulbs when the loss of tidal water becomes so great, that that which remains is incapable of performing the work which it has to do at the harbour's mouth. If the necessary tide receptacle could be above Newcastle, then the estuary below Newcastle might be dealt with, so as to give it the best possible form for navigation up to that town. But in this case the receptacle must be between Shields and Newcastle, 4355, 4356.—Points out some shallow tidal creeks which, if cut off, would increase the tidal column; that there is room for such increase of rise is shown by Mr. Comrie's observations in 1851, that the tides at Newcastle did not rise to the same level as at Shields. When the tide rose to its proper level in the higher parts of the river, there should be no further reduction in the tidal receptacle till the effect of the work at the harbour's mouth had been fully ascertained, 4357.—Assuming that the same quantity of water would go through the minimum section at the Narrows, it would certainly be injurious upon the quantity coming in, to abstract tidal area so as to produce a reflex action at the Narrows; the river might be more than filled up to Newcastle; it might be made to run at a higher level at Newcastle than it attained at the Low Lights; it might be possible to get a rise of 18 inches in that distance, with wind and tide favourable, 4359.—Every dealing with the tidal area in the nature of abstraction at one part does not necessarily produce a heaping up of the water in the channel, 4360.—The water does not necessarily go into the estuary at all, 4361.—Assuming that the same quantity of water passes into a small reservoir as into a large one, the surface of the water will, of course, be higher in the small than in the large one; the tide would rise higher in level, 4362.—The calculation as to how far the tidal area at the sides may be dealt with, and the extent to which the water may be heaped up in the channel to Newcastle, must be based on a given state of the channel, bottom as well as sides, and on a given head and current of tide, 4363.—The result anticipated from these full-tide walls is a higher level at Newcastle, 4364.—That will necessarily be accompanied with an increased reflex action at the minimum section, 4365 —And if carried beyond a certain extent it will diminish the quantity of water coming in through that section, 4366.—The necessary tendency of any heaping up above, consequent upon a reduction of the tidal area, is to produce a reflex action, 4367.—By dealing with the tidal area above the minimum section, so as to occasion a heaping up in the channel, and a higher head from its minimum section up towards Newcastle, will necessarily produce a reflex action at the Narrows; and if this takes place before it is high water, it will lessen the quantity of water passing that minimum section, 4368.—The fall of the tide on the ebb in a river like the Tyne cannot be lower than the ebb at sea, 4370.—Witness is well acquainted with the Ouse and Nene, 4371.—Has reported upon both of them. Is engineer for Lynn Harbour, and is engineer for carrying out works upon the Nene above Wisbech, 4372.—Does not regard those cases as similar to the Tyne harbour or to the Clyde, 4373.—The works on the Ouze and the Nene include the making of their banks parallel, but there is no sea bar or cross current of tide at their outfalls. Witness has already said the same as regards the Clyde, 4374.—Both those rivers discharge into the Wash, 4375.—There is no cross tide in those instances, 4376. —Has reported repeatedly on Lynn Harbour, 4377.— Was applied to in 1838 or 1839 by the corporation of Lynn, as their engineer, to determine whether Sir John

RENDEL, JAMES MEADOW—*continued.*

Rennie's plan of embankment was likely to benefit Lynn Harbour. Investigated the state of the tides, and found that the ebb tide at Lynn was not so low as the ebb tide four miles below in the Wash by four feet six inches, and that the flood tide was not so high by some inches; therefore, when the new channel now opened was proposed, witness advised the Harbour Commissioners of Lynn to make a considerable money contribution to that work, on the ground that it would give them four to five feet more tide at the town quays, 4378.—As regards the question of tidal column maintained at Lynn, there is no difference in the application of the principles which are applied in that case and in the Tyne, so far as they are parallel, 4379.—It would be possible to have a good deep channel up to Newcastle, and a very small quantity of water passing in and out over the bar at Shields, and, as a consequence, a bad state of bar and sea entrance, 4380.—Stated that the works which had gone on upon the Tyne up to the extent to which they had gone in 1849, had not injured the sailing channel, but they had in some parts benefited it, 4382.—It would be the height of engineering presumption to make a large abstraction from the Tyne, before ascertaining by works at the bar, that so large a proportion of the tidal backwater could be afforded, 4383.—The transverse full-tide jetties produce a considerable irregularity as regards the currents, in curves particularly, 4384.—Full-tide jetties are in themselves economical, and rapidly made, and if the object be to get the portions of the shore between them rapidly silted up, such groins are an economical way of doing it; the objection to them is, that owing to the rapid manner in which they reclaim the shores, they commit the Commissioners to whole-tide walls. Sees no economy in them, so far as the building of whole tide walls between their heads is concerned, 4385.—Thinks that the full-tide jetties are not proper conservancy works, either as regards the present or future, if acted on as a rule, 4386.—The silting which takes place at the foot of full-tide and quay walls is owing to the eddy caused by them, 4387, 4388.—Has never found that silting to anything like the same extent with half-tide walls, 4389.—As a matter of abstract theory, full-tide walls will propagate the tide better than half-tide walls, 4390.—The breaking of waves over half-tide walls has the effect of preventing the growth of deposits, 4391.—As regards the scour due to river or land floods, it is clear there would be no difference in their beneficial effect whether the channel had whole or half-tide walls, 4392.—So far as regards the question of land water, the half-tide walls in the Tyne would be quite sufficient, 4393.—The proportion in millions of tidal water over the bar to land water is as 1·7 to 29, 4394.—At the Wear at Sunderland the tide and currents caused by the tide run north and south across the mouth, as they do off the mouth of the Tyne, 4396.—There are artificial piers carried out there nearly to the same distance; if anything, the northern pier rather the farthest, 4397.—The Blyth runs out from the shore almost due north and south, and therefore directly opposite to the principle which is proposed of constructing the southern pier of the Tyne projecting beyond the northern, 4399.—Witness would call this (pointing to the chart) a very considerable bar, 4400.—There is not regular increase of depth. Inside sees two feet. Here (pointing to another part), which is evidently the bar, there is only one foot, 4401, 4402.—Two to one is a considerable difference in such a case. Besides, there is not a high headland or pier at the north side of the entrance, but only a low reef of rocks. The action of the sea over this reef in northerly gales, and the tide as soon as it has covered them, by falling into the channel parallel with the reef, is quite sufficient to account for its maintenance. To justify a comparison with the Tyne, one must suppose a high-tide pier built over this low reef of rock, 4403.—The Humber is a totally distinct case as regards its form of entrance and tidal economy, 4404.—Stated before that, according to his recollection of Giles' survey, made for the late Mr. Rennie, the tide rose at Newcastle to the same level as as it did at the Low Lights, but that he found in 1849, from Comrie's tidal observations, it did not reach the same level at Newcastle by about five inches, 4405.—Has not examined or referred to the section of 1813; never saw it before. The only plans of Mr. Giles sent to witness by the Corporation were the original plotted soundings and sections; and he recollects that Mr. Giles states that he found a tide which rose 15 feet upon the Low Lighthouse, rose to the same

RENDEL, JAMES MEADOW—*continued.*

level at Newcastle Quay. Now, whether it rises at Newcastle 8 inches more or 8 inches less is a question almost entirely dependent upon the state of the wind at and previously to the time of observation, 4406, 4407.

RENNIE:

His line is the red line, *Straker*, 22.—His plan was very perfect, *Calver*, 1576.—His report, extract from, *Brooks*, 2423, 2424.—His soundings are taken to inches; it is a most beautiful survey, *Calver*, 1861.—His survey was in 1813; he made his report in 1816, *Clayton*, 3285.

REPORT, MR. BROOKS':

Of July and November 1851 have not been adopted, *Stevenson*, 1203–1206.

REPORT, MR. RENDEL'S:

Of 1851, has not been adopted, *ib.* 1201–1209.

REPORT OF 1851:

Has not one word to alter in his report; it was written after full deliberation, *Rendel*, 3994.

REVENUE:

Of the corporation of Newcastle, *Clayton*, 3567–3570.

RIBBLE COMPANY ACT:

Clause about reclaimed land the same as in Mr. Allhusen's motion, *Stevenson*, 1442.

RIBBLE, NAVIGATION ACT:

Ordered a survey to be made of the amount of lands reclaimed, *Stevenson*, 1376.

RIVER, DEPTH OF:

Mr. Brooks stated it at 17 feet between Dent's Hole and Shields, but it was not so deep as that, *Purdo*, 556, 557.—The principle is that of contracting the river to a channel, *Brooks*, 2505.—The increase of the cubic contents of the river is very great, *ib.* 2711.—There has been a great depression of the bed. Referring to Mr. Comrie's survey, it has gone down from two to three feet in the Long Reach, *ib.* 2718.—In every instance of any one offending against the Act for throwing rubbish into the river he has been taken before a magistrate. They have policemen up and down the river, and they have fined many people, *Cowen*, 3723–3725.

RIVER FUNDS:

If the river funds had been applied to river purposes the river would have been walled from end to end, and have cleaned itself out, *Poppelwell*, 765.—The whole sum received by the Commissioners in respect of the river all goes to the purposes of the river, *Clayton* 3557–3560.

RIVER FRONTAGE:

Most decidedly agrees in the evidence given by the chairman and town clerk, Mr. Clayton, that the corporation have suffered as much as they have gained in respect of their river frontage by the operations on the river, *Philipson*, 3876.

RIVER LINES:

From Shields to Newcastle, agreed to them, *Straker*, 300.

RIVER LINES COMMITTEE:

Has existed almost from the commencement of the Commission, *Lamb*, 415.—Instructions have been given by the Committee to Mr. Brooks from time to time for several months, to furnish a report to the Commission, *Purdo*, 592, 593.—Mr. Brooks stated that it was in progress, but witness has not seen it, *ib.* 594, 595.—In 1852 was composed of Mr. William Hunter, witness, Mr. J. C. Stevenson, Captain Purdo, Mr. J. Robinson, Mr. S. Lourey, and Mr. M. Poppelwell, the same committee has continued ever since; they are appointed every year, *Cowen*, 2653.—The River Lines Committee have agreed to lines from Shields to Newcastle, *ib.* 3611.—The plan to be laid before the Commissioners is to contain two or three lines in different

River Lines Committee—*continued.*

colours, so that they can in their report show which colour they recommend to be carried up to Newcastle Bridge, *ib.* 3647.—The resolutions of the Committees of the 19th and 24th of August have not been brought before the Commissioners; it was thought desirable to suspend them, in consequence of the business going on before them. The committee were to prepare a short report, and bring it with the plan and lines upon it before the Commissioners, *ib.* 3695.—Thinks parliamentary powers should be obtained for carrying out river lines according to some settled plan to be defined in the Act, *Allhusen,* 3761.—Mr. Nicholson gave evidence that Mr. Brooks, for the works in Shields Harbour, proposed six different lines in three years, *Linskill,* 1036–1041.—Differences between Mr. Rennie's and witness's line, *Brooks,* 2045, 2055, 2064, 2097.—Witness's plan of river lines has never been formally adopted by the Commissioners, but it has always been acted upon, *ib.* 2169.—The plan of 1842 shows the river lines down through Shields Harbour to the sea, and up to Newcastle, *ib.* 2286.—These are not the lines witness approves of now, as necessary changes have been made in the vicinity of Hayhole Dock, *ib.* 2292.—At Whitehill Point the plan of 1842 coincides with Mr. Rennie's, *ib.* 2296.—There have been two committees, Mr. Robinson's and the Chairman's, *ib.* 2330.—Has considered them settled; they have been referred to when applications have been made for licenses, *ib.* 2476.—Does not recollect more than two or three meetings. Always attended them, *Brooks,* 2164–2167.

River Tyne:

Shows how he would deal with the river, *Poppelwell,* 708–711.

River Works:

If they had commenced from the sea or eastwards they would have entailed much greater expense upon the Commissioners, *Brooks,* 2003.—The annual expenditure on river works has not been more than 5,000*l.*, *ib.* 2003.—The expenditure on river works was about 4,000*l.* from 1843 to 1850. The expense of several years would range between 7,000*l.* and 8,000*l.*, *ib.* 2621.—Have altogether cost 17,000*l.*, which witness estimated, *ib.* 2625.—It will take about ten years to complete those contemplated, *ib.*, 2632, 2633.—Statements respecting the expenses of them, *ib.* 2626, 2630.—Have been retarded for want of money partly, *ib.*, 2637.—States the sums expended in 1851, 1852, and 1853, *ib.* 2659.—About 15,000*l.* or 25,000*l.* would put all in a good train to propagate the tidal column much better than at present, *ib.* 2722.—The amount principally for jetties is about 21,000*l.*, *ib.* 2727.

Rock:

Thirty-six acres have been bought of the Dean and Chapter by the Commissioners, *Walker,* 4491.

Robinson, John, Esq. (*Analysis of his Evidence.*)—Is one of the Commissioners for South Shields, 3807, 3808.—Is a shipowner, 3809.—Has not a considerable number of ships, 3810.—Has resided on the banks of the Tyne all his life, 3811.—The condition of the river is certainly improved; the channel is straighter, shorter, and deeper, 3812.—The Commission has worked well generally; the working of it is daily improving, 3813.—On questions which have led to a division has generally voted with the minority, which is principally composed of the parties who promoted the Tyne conservancy. They have strong opinions as to the mode in which the river should be improved; they generally approve of half-tide walls. These motions have, with one or two exceptions, been carried against them; perhaps in some instances they have carried the matter to a factious length, Captain Purdo still continuing to give notice of the same motions after the question was decided. Witness saw it was having a bad effect upon the Commission, and persuaded him to hold it back a few months, promising to bring the subject forward again at a future opportunity; did so, but without success. The minority have still continued, but witness has contented himself with supporting resolutions of that sort when they came. Has frequently thought they rather obstructed the working of the Commission by too many of these motions, and injured their own cause, 3814.—There have been several cases of prosecution for throwing ballast into the river, and one recently for throwing

Robinson, John—*continued.*

ballast on to the quay, and neglecting to take proper precautions to prevent its going down the foot of the quay, when the penalty was 5*s.* Penalties have been levied of 5*l.* or 10*l.* The subject has occupied much time of the Commission, and at last the Police Committee ordered a policeman to travel about the river at night disguised as a seamen, in one of the ordinary skuller boats, by which means a number of cases have been detected, 3815.—Was chairman of the Conservancy Committee of South Shields in 1850, 3816.—Was chairman of several public meetings, but does not recollect Mr. Mather making a speech advocating the insertion of Admiralty Commissioners in the Tyne Bill, 3817.—Was partially of opinion that it would be expedient to have some external control of that kind, 3818.—The local interests of the Tyne are various, but not conflicting, 3819.—Remembers Mr. Brooks's plan of 1849, proposing to cut off White Hill Point by an extent of 200 feet within Mr. Rennie's line, 3821.—The South Shields people always opposed it. Never heard any North Shields gentlemen express their opinion upon it, 3822.—Thinks the South Shields people quite justified in their opinion against it, 3823.—Knows nothing about the Coble Dean Dock, 3824.—Knows Smith's Quay, 3825.—Thinks that is not up to Rennie's line, 3826.—If the works are carried out upon the present line and Smith's Quay remains the frontage according to Mr. Brooks's plan, believes that would involve cutting off White Hill Point, 3827.—To obviate the objections to that, thinks Mr. Brooks proposed to put a wall and something like temporary docks in the bight of South Shields, 3828.—Something similar to the arrangement he proposed at Hay Hole, 3829.—The North Shields party have been several times to Parliament to get a quay at North Shields, 3830.—Thinks it has been opposed by the Corporation of Newcastle, 3831.—In 1852 there was a Bill, 3832.—In 1851, after the new conservancy came into operation, thinks there was a Bill for a quay at North Shields, 3833.—Thinks the existing conservators petitioned against it merely to have the power of opposing it. Does not recollect whether they did oppose it, 3834.—Attended many meetings at North Shields when the Admiralty Commissioners were down, but does not recollect what took place, 3835.—Without reference to any line, thinks it would be of importance to North Shields to have a deep water quay, 3836.—More useful than a shoal water quay, 3837.—At present there is only a small quay of the Duke of Northumberland's, 3838.—Generally coincided with the minority, upon the question of half-tide walls, 3839.—Has been thoroughly opposed to transverse jetties, per se, or even to full-tide walls, 3840.—Thinks that these transverse jetties not only abstract the tide, but lead to eddies and irregularities in the stream. They have all the objections of high-tide walls. and many others natural to themselves, 3841.—Has generally gone with the minority, in fact, always, in their objection to Mr. Brooks's engineering line of policy, 3842.—Thinks, that, as a minority, they have pressed the matter more than is usual in bodies of that sort, but has generally agreed with them in the principles they have expressed, 3843, 3844.—With regard to the requirements of North Shields as to a quay, and the cutting off White Hill Point, and the interests of South Shields, thinks there may be conflicting opinions of policy between the two parties of South and North Shields, 3845.—There have been such already, 3846.—No doubt, as the Commission is at present constituted, there is a preponderance in the west end, 3847.—Does not think the commercial and trading connexions of Newcastle have any influence at South Shields, or over the Commissioners; they have certainly none over witness; he confers more favours on them than they can do on him. The shipowners are the most independent class of men in the world, 3848.—All bodies having the charge of public property should have some control; the Commissioners have a control at present, and witness does not object to the control of the Admiralty over the river as the last appeal, 3849.—The Admiralty have a control in the Tyne, 3850.—They have the power of preventing the waste of the public property, or damage to the river, which is the Queen's highway, 3851.—In the new works in the Jarrow Dock Bill and the Northumberland Dock Bill, there is express control over the plans given to the Admiralty, 3852.—In the Tyne Conservancy Bill, does not know of any more express than their right to control all navigable rivers, 3853.—As far as regards the parliamentary works, thinks the

ROBINSON, JOHN—*continued.*

Admiralty have an express control. It was stated that the Newcastle party would fight to the death on the subject of Admiralty Commissioners. Witness thought it a matter of no great importance; when a life commissionership was offered him, declined to accept it, preferring rather to trust to the townsmen to be elected by them. Thinks a representative body should be solely representative, 3854.—The shipowners are a large party, 3855.—The great bulk of persons possessing property and paying rates in South Shields are shipowners, or are connected with shipping, 3856, 3857.

SAILING CHANNEL:

In the river is better, *Poppelwell*, 674.

SAND:

Great part of the sand which has been removed from the upper part of the river has lodged itself from the lower part of Jarrow Quay up to Willington Quay. The whole space has been very injuriously shoaled, *Straker*, 866.—It is principally marine sand in the lower part of the river, *Brooks*, 2538.—It seems to be the same sand as that found on our own sea shores, *ib.* 2539.—A great quantity comes down the river, washed from the banks by the heavy floods; also a quantity of material is thrown in at the lead works, *ib.* 2730.—The exact quantity of sand removed out of the Tyne since 1813 is 2,698,000 yards, *Ure*, 3083.

SAND BANK:

Plan for forming artificial sand banks, and where they are being used, *Walker*, 4479–4482.

SARDINIAN FRIGATE:

There was a fortnight's dredging to get the Sardinian Frigate down the river without being trimmed, *Stevenson*, 1189–1190.

SEATON DELAVAL ESTATES:

Up to Howdon Dock is one mass of sand on the north shore, *Brooks*, 1983.

SECTIONS:

Made a motion for sections from the bar upwards, but thinks the engineer volunteers to give those sections to Newcastle, *Purdo*, 558.—The Commissioners have never received them, *ib.* 559.

SEVERN:

Is an entirely different case from the Tyne, *Calver*, 1805.

SHIELDS HARBOUR:

The accumulation of ships improves the depth of water, *Lamb*, 394.—Has decreased, *Calver*, 1599.—When a heavy fresh combines with an ebb tide, should say the water runs through Shields Harbour at about four nautical miles—four knots, *ib.* 1841.—By Mr. Comrie's plan, it is found much deeper than in Mr. Rennie's time, *Brooks*, 2003.—Sometimes a fresh takes all the ships away; it has broken the moorings, *Wake*, 3008.—Plans of Shields Harbour, in 1773 and 1778, put in to show the bad state of the navigation at that time, *Brooks*, 2240.—Has had several distinct engineering schemes for the treatment of it, *ib.* 2346.—It is very much improved since 1849, *Wake*, 2932–2938.—The sailing channel from here to Bill Point is much straighter and deeper, but not so wide, *ib.* 2940.—It holds a great many more ships than it did twenty years ago, *ib.* 3014.—In his report of 1851, witness left Shields Harbour very much as he found it, thinking that until docks were made to take the shipping from there it would not do to contract its area; thinks so still, *Rendel*, 3977.—The river above has improved, *Walker*, 4436.—In 1843 it had lines laid down there, but has no lines laid down there now upon the Commissioners' plan, *Brooks*, 4776.

SHIELDS:

The river cannot be improved without advancing the interests of Newcastle, but unfortunately the two parties will never go straight to the object of improvement, *Rendel*, 4043.—Has only of late years been made into an independent port, *Straker*, 54.—Narrows.

SHIELDS—*continued.*

In 1813 a vessel drawing four feet water could proceed from Shield's Narrows, a distance of 28,000 feet, without interruption, *Calver*, 1716.—In 1849 the same vessel would be interrupted at Jarrow Slake, *ib.* 1717.

SHIELDS, NORTH:

No ballast heaps there, *Stevenson*, 1247.—North and South Shields is the deepportion of the Tyne at the present moment, *Calver*, 1820.

SHIELDS, SOUTH:

Considerable ballast heaps there on the land, *Stevenson*, 1243–1246.—When it is low water at the bar it is not low water at Shields, owing to the Narrows between them; the water continues to run out from Shields for some time after the flood has begun; until the flood has neutralized the inclined plane between Shields and the bar there is no upward progress in the water, *Stephenson*, 4246.

SHIELDS QUAY INQUIRY:

Extract from, *Brooks*.

SHOALS:

The principal detached shoals are the Insand, Durtwick, Jarrow Sand, Cockcrow and Walker, *Calver*, 1594.—Are liable to vary very much between low-water mark and their highest point, *ib.* 1788.—Are principally composed of sand, *Brooks*, 2599.—Shoals are mostly sand, but some consist of ballast and coal mixed, *ib.* 2602.—Previously to the establishment of railways between Newcastle and Shields, the best means of conveyance were the steam-boats upon the river. At that time witness had frequent occasion to visit Newcastle, and often was left upon the shoals of the Tyne; first at Jarrow, then again at St. Peter's for two or three hours, waiting for the tide. It is much better now; small packets were then used, but now there are large steam packets for towing, passing up and down the river at all times of the tide, and there are no such occurrences as those just named, *Mather*, 3765–3768.

SHOAL, HEBBURN:

The dredger has not been at work there since the jetties were extended, *Stevenson*, 1307.

SHIFTING SANDS:

It is very difficult to give an estimate of works formed upon shifting sands; it would be inaccurate, *Brooks*, 2235.

SILT:

The amount of silt encumbering the bed in the upper and lower portions of the river is 13,724,000 cubic yards, *Taylor*, 2769.

SILTING-UP IN THE RIBBLE:

Caused by the fixing the channel, *Stevenson*, 1375.

SMITH'S QUAY:

Is in Shields Harbour, considerably within Mr. Rennie's line, *Brooks*, 2342.—If a general measure were carried out they would be quite willing to come to a general line, *ib.* 2344.—Is not aware that the proprietors are under an engagement to the old corporation and the present conservators to advance it out as far as Mr. Rennie's line, *Cowen*, 3666.—Assuming that the works are carried out upon the present line, and that Smith's Quay remains the frontage according to Mr. Brooks' plan, that would involve the cutting off of White Hill Point, *Robinson*, 3827.—Is a valuable quay; it is considerably within Mr. Rennie's line, *Philipson*, 3887, 3888.

SOLID LAND:

It was never intended in Mr. Leslie's case to make land in the way it was made, *Straker*, 895.—Mr. Crawhall's in another case, *ib.* 897.

SOUNDINGS:

Between Hebburn Quay and the lower part of Jarrow Quay. The low-water area has decreased 40 feet in breadth, *Calver*, 1742.—The whole area is less now than in 1849, *ib.* 1743.—Mr. Comrie made sound-

SOUNDINGS—*continued.*

ings for Mr. Rendel in 1849, *Stevenson*, 1411.—Took no soundings in the Tyne, except those of 1849 and 1854, *Calver*, 1856.—On the bar were taken on the 13th and 14th September, just about a week before the equinoctial spring tides, *Comrie*, 1940.—Were all referred to Mr. Rennie's datum, a mark on the low lighthouse, *ib.* 1957, 1958.—Were taken at the ebb tide, very nearly low water *ib.* 1977.—The sands are changing therefrom so very rapidly that general soundings are useless, *Brooks*, 2359.—Has furnished the Commissioners with sections, both transverse and longitudinal, with soundings, *ib.* 2209.—Made soundings in 1849 and 1850, *ib.* 2682.—Lately have all been taken by Mr. Comrie, *ib.* 2683.—Made soundings below bridge, in 1850, 1851, 1852, wherever any material alterations were going on, *ib.* 2690.—There are soundings by Mr. Calver in 1849, over those same places made by Mr. Comrie in 1813, *ib.* 2694, 2695.—Mr. Comrie's of 1854 give one foot three inches more than Mr. Rennie's of 1813 at the bar, *Ure*, 2928.—Different soundings referred to the charts, *Rendel*, 4046.—Mr. Alexander Comrie received instructions to repeat all the soundings which he had made for Mr. Giles in 1813 and for Mr. Rendel in 1849 upon the plan of Mr. Rennie, *Clayton*, 3329.—Has not made soundings, but having examined the charts and sounding made by Mr. Comrie in 1849 and in 1854 very carefully, thinks the channel has been both widened and deepened, *Stephenson*, 4096.

SOUNDINGS OF THE BAR:

Has but once had any soundings supplied by the chairman of the Commissioners, *Purdo*, 577.—Has applied two or three times, *ib.* 578.—The set of soundings gave twenty-six and twenty-five feet water; witness repudiated them, knowing they were wrong, *ib.* 581.—Went with the pilots to see the method in which they did it; saw it was correct and well done, that they took the rise of the water afterwards; the pilots can do that better than any one else in the locality, *ib.* 582.

SOUNDINGS OF SHIELDS BAR:

Remarks upon, *Pearson*, 443.

SOUTH SHIELDS:

The moorings are laid down from funds provided by a tax laid upon shipping, *Wake*, 2948.

SOUTH SHIELDS HARBOUR:

The berthage is a great deal larger than it was within seven months of the moorings being laid down, the width increased 138 feet, *Wake*, 2991.—The greatest improvement is there, owing to the great depth for ships, *ib.* 3015.

SPAR HAWK:

In 1849 there was a channel of from four to five feet between the Spar Hawk and the shore, but not connected with the navigable track over the bar, *Calver*, 1766.—It is nothing but soft sand under the Spar Hawk, 3072.—Is a northern extension of the bar, consequent upon the stream of flood being thrown off by the Tynemouth headland. The mouth of the Tay confirms that opinion, *Rendel*, 3959.

STAITHS:

There are some staiths at Whitehill Point. The Duke of Northumberland has some staiths there, *Brown*, 3161, 3162.

STEAM NAVIGATION:

Gets the same advantage of the deep channel the same as any other, *Calver*, 1851.

STEAMERS:

Ever since steamers have traversed the river, they have had an effect to a certain extent of deepening the channel, *Straker*, 876, 877.

STEAM TUGS:

Are most in use on the Tyne, *Walker*, 4558.—The per-centage of steam tugs employed on the Tyne is very much increased, *ib.* 4560.

STEAM VESSELS:

Are much on the increase on the Tyne; a great deal of the trade of Shields and Newcastle is now being carried on by steam vessels; this will improve the river Thame, *Walker*, 4559.

STELLA:

Relies upon the acquisition of tidal water by lowering the bed in that district of the river, *Taylor*, 2817.

STEPHENSON, ROBERT, Esq., M.P. (*Analysis of his Evidence.*)—Has not been summoned as a witness by either party, but to give information to the Commissioners, 4090.—States that he knows the Tyne very well, 4091.—And has given his attention to its navigation, and to the best way of improving it, 4092.—Coincides in the main with Mr. Rennie's views, 4094. Thinks the changes that have been produced in the river have been decidedly beneficial, 4095.—Has not made the soundings himself, but having examined the charts and soundings made by Mr. Comrie in 1849 and 1854 very carefully, thinks the channel has been both widened and deepened, 4096.—Approves of the encroachments now being made by the engineer in the shape of jetties, provided, in addition, tidal walls are erected so as to make a quay, 4098, 4099.—Half-tide walls, perhaps, might be used in the beginning to aid in the silting up of the spaces; but witness's view of the action of the tidal water would certainly lead him to the opinion that eventually a full-tide wall must be employed. Explains his views, 4100.—Thinks what the Queen's "Commission" calls an encroachment is the best mode of improving the river, 4101.—No harm has been done to the navigation of the river by jetties, &c.; there is no exclusion of tidal water, 4102.—It would be most advantageous if Jarrow Slake and every inlet up which the tide flows at present were entirely excluded, as more water would reach Newcastle than does now; it would tend to equalize the period of ebb and flow. At present at Newcastle they have the flood about 4 hours and the ebb about 8, 4103, 4104.—In the proposal made by Mr. Rennie many years ago to continue the channel of the river, as it were, by a pier nearly parallel with the present channel, he evidently had in view nothing but the scouring of the river, to push the bar further out to sea. Witness thinks he did not give sufficient importance to the question of ships coming in there under a north-east gale, 4106.—Alludes to two parallel piers, 4107.—Mr. Rennie had only one pier on the south side. He was evidently there repeating the results of Mr. Telford or himself in the Norfolk estuary. The river Nene is a remarkable instance of improvements of a most marvellous character, having taken place by confining the channel of the river between two full-tide walls, substituting straight walls pitched on the surface, or very nearly straight, and continuing them, instead of a portion of the river that used to meander through the sands of the Norfolk Estuary. They increased the depth, and they lowered low water at Wisbech something like 6 feet, but it was some years in doing that. Produces a plan of the Nene, and explains it to the Commissioners. The same thing has been repeated at Lynn by Sir John Rennie himself in the construction of a cut, taking off a bend in the river Ouse, below Lynn. States the facts of that case. Thinks these two cases are exactly similar to all the inlets that occur, not only on the Tyne, but on every river; every irregularity, whether on the side of the river in plan, or at the bottom of the river in section, affects the outfall of the water, and raises the level of low water at any point of the river. Thinks it very important to lower the low water, as it lessens the resistance which the ebb makes to the flood in coming in, 4108.—Witness has made several reports on the outfall of the Nene and of the Ouse, which embody mainly the principles to which he has referred, 4109, 4110.—In the case of those rivers the great improvement was due to the mode in which the outfall was treated, so as to increase the amount of tidal water entering, 4111, 4112.—Thinks, but will not give a decided opinion, that the progress of any matter down a river must, for reasons which he explains, be dependent on the quantity of land water, 4113.—For instance, sand at the bottom of a river, 4114.—In a river where there is very little land water it is the column of tidal water, and the amount of that which is admitted each tide, upon which its maintenance depends, though it is not merely a question of quantity, it is the velocity as well, 4115.—In the case of the mouth of the Tyne, there the matter to be considered is the quantity coming in, and then in

STEPHENSON, ROBERT—*continued.*

the upper reaches the velocity is an important element, 4116.—The progress of sewage matter from the upper reaches of a river to the sea is very slow, 4119, 4120.—Owing to the power of the land water over the sea, 4121.—In a case like Portsmouth harbour, where the land water is insignificant, the maintenance of the state of the harbour or of the outfall is entirely due to the tidal water, 4122, 4123.—The object of an engineer in dealing with such an estuary should be to increase the quantity of tidal water which is admitted each tide as much as possible, 4124.—Thinks, from experience of the Nene and Ouse, that the amount of tidal water would be increased by straightening and directing as much as possible the channel of the water, 4125.—Thinks the state of things at the Narrows and at the bar would be improved by making the water flow in a true channel to the sea, 4126, 4127.—Thinks the irregularity of the channel is an evidence of the irregularity of in-going and outgoing current; suspects that the deposition of sand is caused by the Narrows, and this it is which makes the channel so bad. If the channel were improved above, and if the Narrows could possibly be widened, there would be no sand or obstruction whatever, 4128.—Treating this for the present moment as a case to tidal water, which maintains that lower part of the estuary, thinks it is a proper object for engineering, so to direct that current that you may have a true current instead of a devious one, 4129.—Gave evidence last session on the Jarrow Dock Bill in the House of Lords, 4130.—Advocated then the cutting off of Jarrow Slake that the momentum of the column should not be interrupted, 4131.—Jarrow Slake was dry about half-flood from half-ebb, 4132.—It diverted the momentum which would otherwise have been directed up the channel, 4133.—The treatment of the water above the Narrows, so as to take it up to the highest part of the estuary, and the treatment of the Narrows so as to admit the largest quantity of tidal water, may be made distinct questions, 4134.—In dealing with an estuary, dependent entirely upon tidal water, the object of good engineering would be to improve the entrance, so as to get in the largest quantity, 4135.—Which would be effected in this case by so training the channel that the ebb and flood should go in one course, 4136.—Does not think this state of things with two piers (like Mr. Walker's) projecting out would improve the channel at all, but that is a naval question, 4137.—Would look upon it more as a harbour of refuge; thinks it ought to be considered whether ships can approach with safety, 4138–4140.—Viewing it as a question of tidal water admitted and let out, the two piers would act as as a stricture, 4141.—Of course the water on the flood tide would be at a considerably higher level outside than in, 4142.—Is inclined to think that by those piers, although they cause a stricture, the current would be more direct than it is now, 4143.—The water which is entering being due to an elevation outside, of course there would be no direct current setting in; it would not have received from the outside any determination of current, but would make itself a direction, 4144, 4145.—If these piers are put down with no inner works there will be nothing to confine the current, or to prevent its flowing over the whole channel, 4146.—No doubt, as an abstract question, the velocity of the water through the stricture at any given point would be diminished in proportion to the expanse over the area; but as that which has been characterized as a stricture is so much larger than the stricture which already exists, witness does not think it must be looked upon as likely to injuriously affect the river. Circumstanced as this river is, it must not be looked upon as permanently acting as a stricture to the tidal water, 4147.—The area does not begin to tell on the Herd Sands; they are not covered till three quarter flood, therefore the channel is very much confined, 4148, 4149.—As an abstract question, no doubt the set of the flood tide into the harbour would be improved by the lengthening of the south pier. You would catch so much of the momentum of the open tide in the sea; it would be reflected, and pass up the river with a little more energy. The supposed advantage to be derived from that is so small that you must regard the sea there as rising up as a great lake, rising up with scarcely any velocity at all Then it begins to rush into the river; the momentum from that source is so large as compared with the momentum from the flow of the tide in the sea, that you must regard the tide as principally owing to the rush of water from the sea into the river, 4150.—Supposing piers of that sort to be put down would view this case

STEPHENSON, ROBERT—*continued.*

when they were down as due to the simple head of water 99 out of 100, 4152, 4153.—If it is a question of navigation which should always be kept in view in dealing with piers of that kind, it must be considered how a ship can be manœuvred; supposing ships coming in under sail from a north-east wind in distress, thinks the long pier should be to the windward, 4155.—Views this position of these piers as a nautical question with reference to a harbour of refuge, 4156.—As these piers are proposed the bar is within them, 4157.—The position of the headlands in the mouth of the Tay are about the same as in the Tyne, 4159.—Of course the state of things, as regards the transit of the raft and the translation of the mud from the upper part of the river to the lower, will depend upon the quantity of the land water a good deal, and upon the relation which the quantity of land water bears in velocity or volume to the tidal water, 4162, 4163.—Looking to the quantity of tidal water that comes into the Tyne, the land water forms a very sensible portion of the whole, 4164, 4165.—Gives that proportion from about Blaydon, 4166.—The tide is felt there, 4167.—The channel is not altogether maintained there by tidal water, 4168.—It is the Narrows which regulates the quantity of water both going out and coming in. There is a marked difference in the progress of the tidal wave above and below Bill Point, but that might have been predicted; it is a very sharp curve, and must check the momentum of the tide receding, 4169, 4170.—Thinks that point ought to be cut off, as it affects materially the momentum of the tide, 4171, 4172.—One of the greatest improvements to this estuary would be so dealing with the Narrows and its lower part as to increase the quantity of tidal water coming in, 4173.—Thinks this might be dealt with so as to get a good deal more upon the bar, 4174.—Having respect to the light nature of the bed of the river, thinks the best way of improving the bar, which would be a great advantage, both as regards the question of admission of ships during a longer period of the tide, and as regards the increase of tidal water, is to improve the channel of the river from the very top of the tide; does not attach any greater importance to improvements which may be made in the channel below the Narrows, as compared with those above; believes that those which would let the ebb water come rushing from Newcastle, would move that bar out a great many yards, 4175–4179.—If unlimited means were placed at witness's command, he would recommend that the Tyne be treated on one comprehensive plan as a whole, with a view to improving it throughout the the extent of the tidal range, 4180.—Would have some settled plan as regards improvements, and then have them carried out as the means allow; that is now being carried on in the Tyne; they are making jetties with the intention of afterwards putting in longitudinal walls, 4181, 4182.—Has seen that system going on, and thought it was uniform, but there may be some local differences, 4183.—Thinks it would be best to go simultaneously with a longitudinal wall and a jetty, but if they cannot be, thinks probably the jetty in the first instance would be the more desirable, 4185.—As far as jetties *per se* are concerned, does not expect that they will much improve the momentum of the water, 4186.—But in order to get the desired effect, they must be joined by longitudinal walls, 4187.—Does not think half-tide walls would confine the channel of the river and make it uniform, 4188.—Up to half-tide they would be sufficient, 4189.—They would lead to a considerable scouring of the bed of the river, but would not be so efficient as the others, because the greatest scour takes place about half-tide, and then the tide overflows them and the velocity is diminished, 4190,—Does not agree in the general principle that tidal water is not to be abstracted; proposed, in the very question which he mooted with the Admiralty in Jarrow Slake, to abstract tidal water, 4191.—If the effect of abstracting tidal water in the upper part of an estuary should be to diminish the quantity coming in over the bar, it would be injurious, 4192.—Witness's view is this, that to narrow the channel, and take off all the bulbs along the river, would increase the quantity of tidal water which comes in; therefore, when the question is put to him of abstracting some tidal water from a high part of the river as an abstract question, cannot help saying that of course he objects to abstracting it, but then he does not think it is possible to abstract it, 4193.—Witness denies that there can be abstraction, upon the supposition that there will be at least the same quantity of water passing through whatever may

be the minimum section in the lower part. When he first gave his explanation he said, "that more tidal "water would go in after the improvements in the "river were made than goes in now." At present the water at Shields, or at the Narrows, has not got low water when it is low water at the bar, and, therefore, there is an inclined plane upon the surface of the water between the Narrows and the bar, which has to be overcome by a certain portion of the incoming flood before the incoming flood begins to scour the river at all, 4195.—The river may be so dealt with above the Narrows as to get more water through the Narrows than before; because the water will fall lower, 4196,—Always assuming that in narrowing the river they must keep in mind the natural section of the river, and never go below that, 4197–4199.—The water which is abstracted by the cutting off of Jarrow Slake and other bulbs goes to the upper reaches, 4200.—If the same quantity of water comes in through the minimum section it must go higher up; therefore there is no objection to taking off Jarrow Slake, or other bulbs, which interfere with the momentum, so long as you do not narrow the river to such an extent as to produce a recoil which shall reduce the quantity coming through the Narrows, 4201–4203.—The reduction which is to be permitted ought to be calculated and laid down very accurately, 4206,—Stated before that the navigable channel had been both deepened and widened, 4208.—Which evidence was derived from a comparison of a chart made by Mr. Comrie in 1813, and Mr. Comrie's chart of 1854. and with the chart of 1849, 4209–4214.—The result to be endeavoured to be attained is the depressing of the low water surface and the raising of the high water surface, 4215.—In proportion as you succeed in that you get in a larger quantity of tidal water, 4216.—In comparing the surveys and soundings, has observed the state of the channel abreast of the insands in Shields Harbour, 4217.—The flood tide through the middle or the tail of the insands has got shoaler, 4218.—Considers that evidence of an improvement in respect of the channel, 4219, 4220.—Speaks from comparing the charts, 4221.—There is an accumulation, no doubt, at the Durtwich Sands, and witness conceives that inasmuch as it closes up the swashway, which a portion of the tide went over, in proportion as it silts up, it turns more water into the main channel of the river, and consequently improves it. It may affect the question as one of landing places or some local interest, 4222.—Does not think that the velocity of the current will at any time be so seriously increased as to cause danger to ships, 4223.—Has always advocated the formation of docks in the river very strongly for the last twelve years, and thinks it is the universal opinion amongst those who are acquainted with the trade of the Tyne, 4224.—As the water moves along the shore from north to south opposite the Tyne, the impulse of the tides, taking the two kinds together, will not be so great as that in the Bristol Channel at the mouth of the Severn, where the tide acts in the same direction as the river, instead of passing across the mouth of it. The effect of raising the water in the river, in the two cases, will be of the same nature, but different in extent, 4226–4230.—The more the course of the river corresponds with the direct impulse of the tide, the greater, generally speaking, will be the rise of the water in that river. Thinks the great rise in the Severn is not owing to its receiving the direct impulse of the great tidal wave, but it is owing chiefly to its peculiar form, 4231.—Believes in the Tyne the water does not rise in any part of the river above the horizontal level taken from the Narrows up to Newcastle bridge, 4232.—The results therefore of the combined action, be they what they may, are quite different in the Tyne and Severn, 4233.—It is seen by the charts that the stream of tide runs past Tynemouth Head, while the water is rising some time before it begins to flow up the harbour. There is a difference. Sailors call it tide and half tide, tide and quarter tide, and so on; but the effect is, that the stream outside in the offing is progressing in one direction while the stream from the harbour is running in another, 4234.—The chart says the current under Tynemouth Head begins to run in over the Black Middens one hour after the tide begins to rise, 4235.—The vertical movement of the water taking place under Tynemouth Head an hour before any effect is found in the stream flowing into the mouth, 4236.—Thinks probably that during that hour the water between Black Middens and the Narrows is quiescent,

4237.—Believes the silt then deposited to be the true cause of the bar, 4238.—During the time that the stream inwards sets towards the Narrows, thinks, but it is only an opinion, that the current will be upwards through the Narrows, 4239, 4240.—But stationary at the Black Middens, and of course not running over the Herd Sand, because that is then dry, 4241.—Some time after the flood tide begins to make, the water is still running from Shields through the Narrows, 4242.—It is still running out, but rising, showing that the ebb tide there is affected by a stricture, 4243.—Supposing that the tide wave passes along any coast in which there are a number of inlets at right angles to that wave running up a considerable distance, high water in those inlets far up will not be coincident with the high water outside, 4244.—They will be derived tides, which will vary, 4245.—High water at the mouth of the Tyne ought to coincide with the crest of the wave passing the mouth. When it is low water at the bar it is not low water at Shields, owing to the Narrows between them; the water continues to run out from Shields for some time after the flood has begun; until the flood has neutralized the inclined plane between Shields and the bar, there is no upward progress in the water, 4246.—When fresh and salt water meet in a regular channel there must be a rapid mixture, 4247–4249.—In some rivers the fresh water runs over the salt, but witness does not believe in the salt pushing itself under the fresh, 4250.—The greater part of the detritus of a river is carried to sea in the course of ages, 4251, 4252.—Witness adheres to the answer which he gave before, that the momentum of the impulse derivable from the tidal current along the ocean, from north to south, was not great as compared with the impulse which the tide going into the river receives from the lift from the ocean; and he put it in this way: the lift of the tide is, say, about 15 feet in round numbers, a knot and a half an hour would be equivalent to a head (because that is, he thinks, the mode in which he put it,) of not more than about three inches. Supposing the current came across the ocean, and went right over the bar without going at right angles, and supposing the great tidal wave was a wave of translation at the same time, a knot and a half an hour (speaks merely from mental calculation just now) would not increase the tide more than about three inches; that is, taking the full advantage of the tidal translation as compared with the full lift of the great tidal wave; and thinks they may be compared to each other in that way; thinks it a fair way of putting it, 4253.—The head of wave that witness referred to as producing the velocity, produces, in addition to the original momentum of the water, only a velocity of three knots an hour, 4254.—The head of water necessary to produce a velocity of three knots is very small, 4255.—If the last calculation were correct, it would bring it to a foot, 4256.—That is the effect of the wave and of the original velocity. Does not think, looking at the sources of the two things, that the original velocity is a considerable ingredient in the velocity. The one is velocity derived entirely from an absolute column of water from the lift of the ocean. It is to be considered what the effect of the other will be, moving nearly at right angles to the velocity which is created by the tidal wave. Therefore any other velocity at right angles can hardly be supposed to add to the velocity of the former, because any two forces, the one at right angles with the other, have no effect upon each other. Therefore, unless a pier is put projecting on the south side, thinks there is no advantage at present, 4257.—In comparing an orifice exactly at right angles to the current of the water, and a trumpet-mouth formed by a projecting south pier, thinks there would be an addition given to the tide by the south pier; but witness will not venture, after the doubt which has been raised by Mr. Brunel, to state that he has any great confidence in the view which he has thrown out as a mode of comparing them, 4258.—Thinks there is not much advantage derived in the quantity of water poured into a river during the rise of the tide by the coast current, 4259.—Thinks the pier question resolves itself into a purely naval one almost, 4260.—In the present state of things in the Tyne, so far as regards the entrance of the tide, views it simply as a question of head and pressure; there is a slight translation of water, 4262.—The current up the Tyne is due simply to head, 4263.—There is at present nothing at all analogous to the heaping up, due to the change of form, which takes place in the Severn, 4264.—The water does not rise in any part of the Tyne above the sea, but in the Severn

STEPHENSON, ROBERT—*continued.*

it rises 30 feet above the sea, 4265.—Which is due to the contraction, and the change of form which the water experiences by contraction, 4266.—There is some contraction in the Tyne, 4267.—Below the Narrows it is very small, 4268.—Witness recollects that he did say, in his examination in the House of Lords and Commons about the Nene, that there were some estuaries or tidal rivers which would be better if the land waters were entirely abstracted from them, such as the Nene, which comes through a long level country, and brings down a quantity of mud and rubbish, which is a great nuisance to the tidal part of the river. There is very little current, 4269.

STEVENSON, JAMES COCHRANE, Esq. (*Analysis of his Evidence.*)—Is one of the Life Commissioners named in the Act, 1078.—Has resided for the last eleven years in South Shields, 1080.—Has given attention during the last five years to the river, 1081.—Witness points out the jetty referred to by Captain Washington, and shown in Mr. Calver's report, 1084, 1085.—It is one of two jetties which have since been lengthened; one was lengthened 66 feet, and the other 100 feet, by the present conservators, 1086–1088.—Witness objected to the lengthening of the jetty, but was outvoted. 1089.—The plan is the one Mr. Brooks is in the habit of producing before the Commissioners, 1090.—At the time Messrs. Palmer's enclosure was sanctioned by the Commissioners at large, there was no special plan of the work before them; this plan was certainly laid before them, and Mr. Brooks unrolled part of it, and pointed out the position of the works, but there was no special plan of the work itself, 1091.—There was no proper plan, but previously to the formal sanction by the Commissioners at large of this enclosure, they held a view upon the place, and a plan was produced. A few of the Commissioners standing on the quay, had a conversation round about this plan, and then and there a pencil line was laid down upon the plan which remained in the possession of Messrs. Palmer. The resolution of the Commissioners which refers to a certain line, refers only to this pencil line, which was not before the Commissioners at the time the enclosure was sanctioned, 1092, 1093.—It was a pencil line stretching from Messrs. Palmer's property to the Muckhouse; does not know that it was the same line, but in the same direction, 1094.—The line showed the direction which Mr. Brooks designed on that day when the pencil line was laid down on the plan; it was left in the possession of Messrs. Palmer Brothers, 1095, 1096.—The Commissioners had no copy at the time witness objected; at the time when the enclosure was granted the minutes were unintelligible, 1097.—The return which was ordered of the quantity of land granted to Messrs. Palmer, was not furnished for several months afterwards, 1098.—Could ascertain by referring to notes whether the return was subsequent to the report of Mr. Calver, 1099.—Believes the return was previous to the report being made, 1100.—There was a meeting on the 22d of August 1853, at which Messrs. Palmer, accompanied by their solicitor, Mr. Philipson, appeared before the board, and argued that the quantity of land actually granted was to the whole extent of the line already described, and that the quantity of land granted by the Commissioners was not limited to the $5\frac{9}{10}$ acres which Mr. Brooks had reported as being the enclosure, 1102.—Mr. Philipson is a solicitor; he appeared there in the capacity of solicitor. He was not at that time a Commissioner, but was one previously, and is now, 1103–1105.—There was no licence to Mr. Ellison; they referred to the wording of the minute; it was by an ingenious collation of Messrs. Palmer's application for the enclosure and the resolution of the Commissioners on the subject, that Mr. Philipson's argument was founded; that the enclosure in question really extended beyond Mr. Brown's property into Mr. Ellison's, and as far as Messrs. Palmer held on lease from Mr. Ellison, which witness understood was to the Muckhouse, 1106.—Messrs. Leslie's first application was on the 19th December 1853. At that time Mr. Leslie had taken a piece of ground from Mr. Ellison, to the east of Hebburn Quay, just by the letter Y, the lower plan in the word "Quay," represented by the bright red spot on the upper plan. Mr. Leslie had taken ground there for a ship building yard, and he came to the Commissioners with an application to be allowed to pave the slope which extended from the high-water margin about half way down to the half-tide wall, which had

STEVENSON, JAMES COCHRANE—*continued.*

by that time been commenced in front of the place. The Commissioners viewed the spot, a plan and section were produced, and the application was confirmed at a meeting of the Commissioners on the 12th of January 1854, 1107.—The application that Mr. Leslie might be allowed a supply of dredged materials for the paving or making this slope was granted, but on the express condition that these dredgings should not be used to raise the place higher than was shown in the section which accompanied Mr. Leslie's first application, 1109.—The height was considerably below half-high tide height, 1111.—There was a discussion on the 4th May; witness reads the minutes of the Commissioners on the point, 1112.—The amendment was put and carried on a division, there being for the amendment seven votes, and against it six votes, 1113.—The chairman holds his hand up first, according to ordinary practice, 1114.—On the 14th December last another application was put in by Mr. Leslie to raise the area, or a considerable portion of it, up to full-tide mark, and make solid land of it, 1115, 1116.—The Commissioners adjourned the consideration of it, and the thing stands over yet, 1117.—These discussions were essentially connected with the full-tide jetties, for this reason, that among the very few things which Mr. Robinson's River Lines Committee would agree upon was, a half-tide wall, which they all unanimously recommended from about the Muckhouse up to Hebburn Quay. Immense importance is attached to Mr. Leslie's case as defeating entirely the so-called experiment of the half-tide wall, 1118.—Took the advertisement which appeared in the papers from *The Gateshead Observer* of September 1853; it relates to Mr. Ellison's property, which extends from Messrs. Palmer's plan at Jarrow up to the Pelaw Staiths, about 2½ miles, 1119–1121.—The first application was made on the 19th of December, and the advertisement is in September 1853, 1127.—If the recommendations of the River Lines Committee is carried out, this will not become solid land, 1128.—There are two River Lines Committees: the first one was Mr. Robinson's, in 1852, the only result of which was the recommendation of this half-tide wall; they could not work. Mr. Robinson's Committee fell through, but Mr. Allhusen's Committee was appoineed in the beginning of last year. They made a report which witness moved should be printed. Has not seen a copy, but believes it was carried, 1129, 1130.—It does not appear on the minutes that witness wished the report to be printed; but a newspaper confirms his recollection of wishing it to be published, 1131.—Would not argue from there being no notice of it in the minutes that the printing the report was not mentioned. There is a great deal of confusion at the Commissioners' meeting, and it is quite possible that it may have been omitted to be taken down, 1133.—There have been some scenes occasionally at the meetings, 1134.—Witness has Mr. Brooks' printed report before him of December 1850; that was about a couple of months after the Commission commenced, 1137.—Mr. Brooks' statement at the time was in reference to complaints which had been made by the proprietor of Walker Colliery, and Mr. Brooks said, "If the Commissioners for the Improvement of the "Tyne continue to me the confidence with which I "have been hitherto honoured, and allow me to exe-"cute the works which are yet incomplete, and the "adoption of temporary measures to accelerate that "which the current is now slowly performing, I feel "quite certain in my own judgment of speedily clear-"ing away the only difficulty which now exists to "vessels of 16 feet draught getting up to Newcastle "in ordinary spring tides. For this purpose I advise "the temporary lengthening of the two jetties on the "west side of Hebburn Quay, the westernmost to an "extent of 66 feet, and the other of 100 feet in the "first instance, and afterwards, if advisable, for the "reasons above stated, the further construction of the "jetty planned originally by me near the centre of "Hebburn Quay, but that it should be extended 200 "feet in length. The whole of these works will not, "however, cost 500*l.*, including timber and iron, most "of which will be available for other works after the "lapse of about three years," 1138.—This is a printed paper headed "Tyne Improvement Commission," received and ordered to be printed for the use of the Commission, and headed "Hebburn Shoal," being a report of Mr. Brooks, dated the 26th of December 1850, and addressed to the chairman of the Tyne Improvement Commissioners, 1140.—On the 14th August 1851,

witness received another report from Mr. Brooks, of which the following is a paragraph: "For the infor- "mation of your Board, as well as for the trading "interests of the town of Newcastle, I have to report "that, in the worst part of the navigation, namely, at "Hebburn, there is a depth of four feet at low water "of spring tides, when the surface of the latter is at "the level of 12 feet 10 inches below the datum line, "or high water of the spring tide, from which the "soundings are calculated on Mr. Rennie's plan of "1816." That was equal to 16 feet 10 inches at that date over Hebburn Shoal by Mr. Brooks' report. He goes on further: "When I am allowed to carry into "effect the works referred to in my report to your "Board in December last, I shall be able to testify to "a depth of 18 feet over Hebburn Shoal from the "same datum," 1141.—On the 22d of December, at a meeting of the Commissioners, Mr. Brooks presented another report on Hebburn Shoal. He requests to be honoured with instructions to remove Hebburn Shoal, and states that until this change be effected, that is the change in the direction of the current, Hebburn Shoal must remain, and with a contracted navigation in the "concave channel immediately below." A discussion took place upon this report. Witness thinks a motion was made by the late Mr. Lowrey, but is not sure, 1142.—Mr. Lowrey was one of the Newcastle Commissioners, an alderman of Newcastle. The motion was that Mr. Brooks be allowed to execute the works in question. It was put to the vote, and the jetties were ordered by a majority of 10 to 5. Believes Captain Purdo voted in the majority, 1143.—Captain Purdo voted against witness as an experiment. Witness mentions this as a reason for the apparent anomaly of Captain Purdo voting against his usual side. The other gentlemen of the majority supported them on the expectation that Hebburn Shoal would go, and go without any further expense of dredging, 1145. —Another report was requested by Captain Purdo from the engineer upon the subject of dredging. Upon the 22d of December 1851 the jetties were sanctioned From February 1852 to March 1852 14,444 tons were dredged, 1146.—By Hebburn Shoal witness does not mean to identify any particular point in the bed of the river, but the district in the neighbourhood of Hebburn Shoal, both on one side and the other, within a very short distance, 1147.—Mr. Brooks states in his report, in reference to dredging, from February 1852 to the 30th March in that same year, he reports 14,444 tons, in attempting to cut a passage through the Walker Sand, in lieu of the dangerous, tortuous course over Hebburn Shoal. Then between March and May of that same year the dredger was engaged in widening the deep channel abreast of Coxlodge, and raised 2,894 tons, 1148.—Cockcrow Sand is in the neighbourhood, 1149.—The dredging just mentioned is that which took place after the jetties, which were called experimental, were erected, 1150.—Witness has another report from Mr. Brooks of the 24th March 1852. In order that a fair trial might be given of the effect of those works, witness moved that a survey should be made of the neighbouring reach of the river, before the extension of the jetties, and that those surveys should be repeated from time to time, and laid before the board, in order that they might come to a proper conclusion on the subject. A report was read from Mr. Brooks, accompanied by elaborate soundings of the river from Tyne to Hayhill Points by longitudinal sections. Witness calls attention to what Mr. Brooks says of the state of the Long Reach: "In the Long "Reach, or over the worst part of Jarrow Shoal, "18 feet 6 inches;" and he concludes his report by stating, "I have but to state that, with the present "available means, I expect to be able, before the end "of this year, to have an available depth of 18 feet up "to Newcastle Quay," 1151.—From the 24th December 1852 to the 15th February 1853, 15,786 tons were dredged; that was after this report of March, 1153.—The dredger was still there to widen at Coxlodge; it is stated in the report to the extent of 3,114 tons, 1154–1156.—There is another report of a similar character, of the 21st of July 1852, 1157.—There has been since that time a great deal of channel dredging to do. The dredger is continually required for shipping berths, in fact to so very great an extent that there is more demand for shipping berths than can possibly be supplied by the dredger, 1159.—It has lately been employed in clearing out some shipping berths at Jarrow Quay, and in clearing out shipping berths in the Hay Hole, and at the wharf of the chairman of the

Commissioners, and at Wellington Quay, 1160.—Witness's object in bringing forward these facts is to show that the expectations held out by Mr. Brooks in his report are very far from being realized, 1161.—Witness is against the system of transverse jetties, and partial operations too, 1164.—In 1853 there was a report advising additional jetties of a temporary nature. There was a discussion about the same time in the Commission, when by a majority of one it was resolved, that instead of those additional jetties by which Mr. Brooks wanted to cure Hebburn Shoal, another course should be adopted. Mr. Brooks states in his report of March 10, 1853, that the navigable depth had been in the early part of the year only 2½ feet at low water spring tides; adding 12 feet 6 to make it 15 feet, 1165.—The report is in March 1853; but it states that that depth of 2½ feet had existed previously in the early part of the same year, 1166.—Witness is confusing the dates. The report was in March, but the report of March 1853 did not give the 2½ feet as soundings in March 1853, but as the state of the soundings subsequently to this report of the 27th of January 1853, in which Mr. Brooks reported in reference to the half-tide walls, which had been carried by a majority of one, 1168.—On the 13th January there was an amendment in favour of the adoption of the report of Mr. Robinson's River Lines Committee against Mr. Brooks' advice, 1169.—On the 13th January there was a resolution of the Commissioners, adopting half-tide walls against Mr. Brooks' transverse full-tide jetties. This was a recommendation which had been come to during Mr. Robinson's River Lines Committee of 1852, 1170, 1171,—The committee gave no reason for their opinion, but those who supported the recommendations of the Committee gave their opinion that the temporary measures had been unsuccessful, and recommended the half-tide wall. 1172.—January 27th 1853, Mr. Brooks reported that half-tide wall took a long time to make, and that he would adopt the recommendation of his previous reports, namely, the formation of the two jetties abreast of Hebburn Quay. There is still some confusion regarding the 27th of January. There is no doubt that at a previous meeting a majority of one had recommended the formation of the half-tide wall, and rejected the proposal of the jetties; but at this meeting a fortnight after the tidal water gemtlemen gave way, and allowed the jetties to go up there, as a means of facilitating the construction of the half-tide wall; they were to be very temporary, 1173.—The tidal water gentlemen who had carried the amendment in favour of half-tide walls on the 13th of January were induced on the 27th of January to acquiesce in Mr. Brooks adopting the jetties, 1174.—In the report of the 10th of March, 1853, Mr. Brooks says, "On the 31st January the jetties on the south shore were commenced, and their almost immediate result was the clearing out of the east end of the northern channel to the depth of 4½ feet at low water," 1175.—Mr. Brooks stated that the water in the new channel was 4½ feet at low water in January. This he stated on the 10th of March, 1176.—That extension of the jetties was followed by a narrowing of the channel of the navigation below, between Cockcrow Sand and the north shore, 1177.—It was necessary then to give an official notice to vessels, 1178.—The nature of the notice was that a number of vessels which had previously lain in the channel must be reduced so as to have one line at a time instead of two, 1179.—In July of last year an advertisement was put out by the harbour master, that instead of having any vessels at all at the tiers, there the vessels must be kept close into the shore, and the mooring buoys which were in the channel were removed, and dolphins were driven into the chalk wall on the north shore, for the purpose of tying the vessels close up to this north wall, so as to allow of the navigation being free past them, 1180.—Witness is certain that the channel has been narrowed between the Cockcrow Sand and the north shore, 1181, 1182.—The notice of the harbour master referred to the part of the river immediately below Hebburn, on the north side, 1183.—In the minutes of the proceedings of the 10th of March Captain Purdo asked for information, and repeated his question several times, what the engineer really intended to do with this long stretch of shore from Jarrow to Pelaw; whether he intended to make it solid wall or jetties, or how it was to be? He repeated the question at more than one meeting, and he could not extract from the engineer any positive expression of his intentions with regard to it, 1185.—He asked for longi-

STEVENSON, JAMES COCHRANE—*continued.*

tudinal sections, 1187.—Believes only one has been furnished, which showed the river to be in a very excellent state, 1188.—On the 28th of April 1853 there was a further report of Mr. Brooks, with a recommendation that Bill Reach should be dredged for a fortnight, in order to get 17 feet up to Newcastle, and that the Sardinian frigate might get down the river without being trimmed; it was a fortnight's dredging, 1189.—There was a good deal of dredging wanted before the Sardinian frigate could come down drawing 16 feet, 1190.—On the 22d September 1853 there was a complaint against Mr. Brooks for putting dredged materials behind those so called experimental half-tide walls; he was ordered not to put any more behind them, 1191.—Witness refers to this enclosure of Leslie's gradually going on to show that the intentions of River Lines Committee were not really being carried out, because it was avowedly, as an experiment, one of the principal points in dispute, which that experiment was to settle, being this, whether half-tide walls when they were made would, as Mr. Brooks always asserts, gradually fill up to solid land, and witness wished that nothing should be actually put into those places, because it would spoil the effect of that experiment, 1192.—There is a half-tide wall no doubt being made there now, but it is crossed by full-tide jetties, which actually in some places project beyond the line of it, which jetties were only to have been temporary three years ago, and were by this time to have been used up for some other purpose, but there they are still, 1193.—Witness has done all he could to obtain a suspension of the system of full-tide transverse jetties, 1194.—Witness has read all he can upon the subject of half-tide walls, especially Mr. Rennie's report of 1813, and the plan which he shows is the adoption of half-tide walls, leaving the spaces on each side of them to be overflowed with water every tide, also the cutting off of points and generally training the river, 1195.—Does not agree with everything Mr. Straker said, but agrees with half-tide walls on so high an authority as Mr. Rennie, 1196.—Has read the report of the Tidal Harbour Commissioners, and observed the same caution regarding the preservation of tidal water for bar harbours laid down, 1197.—Witness was guided in the course which he has taken by Mr. Rennie's recommendations, confirmed by the Tidal Harbour Commissioners, 1198.—Mr. Clayton, in his speech to the Municipal Inquiry Commissioners in 1833, takes credit for the corporation of Newcastle having employed Mr. Rennie, 1199.—No one can pretend to say Mr. Rennie's report was carried out, 1200.—The River Commissioners, on their first meeting in November 1850, ordered a report from Mr. Rendel, who had surveyed the river on behalf of the corporation of Newcastle, and had given evidence, but who had never made a report, 1201.—Mr. Rendel was a marvellously long time furnishing his report. Witness waited ten months; meantime there was scarcely any discussions upon the point, every one suspending his action till he should get it, 1202.—Mr. Rendel and Mr. Brooks reported at the same time, 1203.—Neither Mr. Rendel's nor Mr. Brooks' report has been adopted, 1204.—Refers to Mr. Brooks' report, dated July 1851, but he kept it in reserve so as to present it simultaneously with Mr. Rendel, 1205.—There is another report of November 5th 1851. Mr. Rendel's report was received about October, 1206, 1207.—When the River Commissioners entered upon their duties, they found a full-tide wall in the course of construction at Willington, at Walker, and about Wallsend, with which Mr. Brooks was going on under the old conservancy; he just went on as he had been doing, without any express instructions, and at first there was no opposition made to it, because they were waiting for the two reports, 1208.—By the time Mr. Rendel's report had been received, witness had made up his mind that the principles advocated by Mr. Rendel and Mr. Rennie ought to be adopted for the conservancy of this river. Is not peaking of particular river lines, but the general principle that the river above Shields Harbour was to be treated as a tidal receiver, 1209.—Is confident that, looking to the action of the waves in the Long Reach, which is extremely exposed to westerly gales at the lower end of it; and, in fact, the whole of the river below Bill Point the waves lash the shore with so great violence, that it would prevent those foreshores to full-tide, which Mr. Brooks anticipates. And where the half-tide walls and quarter-tide walls have already been built, any one may observe that the silt has grown up to the height of the walls, and there it remains; of course the jetties

STEVENSON, JAMES COCHRANE—*continued.*

shelter the places under the lee of them from the lash of the waves, and they are higher than they would be if they were more exposed, 1210.—Has visited the River Ribble. Mr. David Stevenson has been engineer to the works carried on there. Parallel walls have been adopted. Witness does not think there was much dredging, 1211–1214.—The foreshores on the Lune have not grown up; there is not any loss of tidal water by adopting the walls, and the channel has been very much improved, 1215.—There has been scarcely anything worthy the name of new works done since the new Commission came into operation in 1850, with the exception of Northumberland Dock, which is an important work, and to which witness has no objection whatever; quite agrees with it. There is the still more important work of the piers going on under the Commission, but most of the controversy has arisen regarding the training of the river above Shields, 1216.—The Northumberland Dock and the piers are works carried on under distinct parliamentary power; to this witness has no objection, 1217, 1218.—As regards conservancy work and the general training of the river, there have been no new works, excepting those at Jarrow, and the extension of existing works, 1219.—Thinks Mr. Brooks's engineering works have been a total failure, 1220.—One argument used against the adoption of full-tide embankments was, that we must have some place to deposit the ships' ballast, which is the great curse of this river, and dredged materials, 1221.—The dredging might be done for less than half its present cost, 1222.—The Shields shipowners are very earnest in wishing the adoption of hopper barges, as being a cheaper mode of conveyance. It is cheaper, but ships' ballast cannot be taken to sea and disposed of at anything like the same rate per ton that the immense quantities raised by a dredging machine can be done, 1223.—The ballast might be disposed of by the hopper system at a very much less cost than it now costs the conservancy, the dredged ballast more particularly, 1224, 1225.—It was a subject of a specific report of May 1852, which was signed by witness and other members of the Finance Committee. Witness hands it in, 1226.—Mr. Brooks was ordered to report what it would cost the Commissioners to adopt the system for the dredgings; he objected at first, but at length handed in this report of the 27th October, 1852, 1228, 1229.—It has never been resolved that Mr. Brooks' hopper system should not be adopted; it has been acknowledged that it would be an improvement, but from one thing and another it has never been adopted, although in getting a new dredging machine it was resolved that it should be worked by means of hoppers. Witness wished the system to be adapted to the present dredging machine, but was overruled in that, 1230.—The conservators now are under the obligation of receiving ships' ballast, and providing a place of deposit for it, for which receipt they get 16*d.* a ton as conservators, 1231, 1232.—The conservators for receiving that 16*d.* a ton from the ship provide a place of deposit for it, which they do by a sort of sub-contract, 1234.—The corporation of Newcastle are ballast conveyors under the Commissioners. They make a profit of it, according to their last accounts, of 700*l.* or 800*l.* a year, 1236, 1237.—When the terms of the payment to the corporation were proposed and settled, Mr. Poppelwell moved that they should get 2*d.* or 3*d.* less than they now get; but they still continue to get it, 1238–1240.—They make a profit as ballast conveyors out of the conservators, 1241.—In the Tyne a good level site for manufactories adjoining the river is very valuable indeed, 1242.—There are considerable ballast heaps at South Shields, but they are on the land. They were made under the licence of the corporation, like everything else in olden times, 1243, 1244.—There are no ballast heaps at North Shields, 1247.—There is no ballast put into the Dean and Chapter's property at all, excepting a comparatively small portion at the west end, and the places opposite the corporation property are nearly filled up already, 1248.—The corporation have already made most of the land, almost all that is to be got, opposite their own estate, 1249.—Land of that kind, with deep water in front, is worth, at a low estimate, 30*l.* per acre per annum, 1250.—Judging from the surveys, the high water mark from the sea to Newcastle is very level, 1251.—The Commissioners have no sufficient means of ascertaining the precise state of things as regards the level of the tides. Mr. Comrie in 1813 took a very careful series, and other tidal observations were made in 1849–50 by Mr. Calver

STEVENSON, JAMES COCHRANE—*continued.*

and Mr. Comrie again. Witness has never seen them, though the Commissioners paid for them. Has seen some of them in a printed book published in London in 1850, but has asked for the records themselves over and over again, and failed, 1252.—The book in which witness saw them was by an engineer named Beardmore, not connected at all with the inquiry, 1253, 1254.—Several thousand pounds were paid to Mr. Rendel for his report and these observations, 1255.—No use has been made of Mr. Rendel's survey, excepting that a copy has been lithographed from time to time for the Parliamentary plans; has never seen his tidal observations, 1256.—The only thing witness has ever seen, which forms one part of Mr. Rendel's appendix to his report, is a diagram of two tides of Mr. Comrie's, 1257.—The tidal diagrams are valuable documents at all times. The average is all Mr. Rendel gives in his report, 1258.—Wishes tide-gauges to be set up in the river, say one at Newcastle, and another half way down, to correspond with Trinity House tide-gauge, at the low end of the harbour, so that one could tell whether there was any depression of the low water level or not, but they have never been put up, 1259.—Captain Purdo read on one occasion what purported to be a series of depths on the bar, a comparison of some years back and 1850, or something of that kind; it showed a considerable decrease of water on the bar; between 1841 and 1850 the accuracy of the soundings was impugned, 1260–1264.—Reads a report from the newspaper in reference to Captain Purdo's evidence, 1268.—Mr. Clayton, who is clerk to the Commissioners, is also town clerk to the corporation. It is one of those things which the promoters of the Shields Bill were obliged to submit to, 1270, 1271.—There are many instances in which the questions of the rights of the corporation and the rights of the conservators come in conflict, or ought to come in conflict, 1272.—The promoters of the Shields Bill wished the whole of the coal due to be transferred to the new conservators; the Corporation of Newcastle claimed a part of it; it was arranged that three-eighths should be transferred. Since then, there has been a good deal of discussion with regard to the harbour charges in general, and Her Majesty's Commissioners for inquiring into Local Charges on Shipping visited this neighbourhood in September twelvemonth, when Mr. Clayton appeared in defence of the coal due. Some of the Tyne Commissioners appeared there to argue that the coal due ought to be either abolished or transferred to the river. Since then these Royal Commissioners have reported that the remaining five eighths of this coal due ought to be transferred from the Corporation of Newcastle to the conservators. The amount involved is 10,000*l.* a year, which would be a very seasonable addition to the River Commissioners' funds, of course at the expense of the Corporation of Newcastle. Of course, as clerk to the Commissioners, it is Mr. Clayton's duty to get possession of the 10,000*l.* a year; as town clerk of Newcastle, he will no doubt be doing his duty to the Corporation to do all he can to keep it, 1273.—The ratepayers of Newcastle would not approve of having this 10,000*l.* a year from coal dues spent upon the river instead of on their own streets, 1274.—Statement from the report of the Tidal Harbour Commissioners in the case of the Dee, 1276.—The accounts have been printed, and are presented in a detailed form to the Royal Commissioners, 1277.—The nominal revenue is about 19,000*l.*, but the sum spent in the first three years really upon river operations is only 17,000*l.*, the rest being salaries, harbour charges, law charges, interest of debt in building Newcastle Quay, and conveying ballast, 1279.—Under the head of dredging in the first three years there is 11,604*l.*, and under the head of river improvements 5,643*l.*, 1280.—Being satisfied that the work could be done for half that cost if the Sunderland system were adopted, witness puts down half the cost of dredging to land making, 1281.—In the ballast conveying 13,190*l.* has been expended in the three years, of that 5,626*l.* has been paid to parties who made land of it in front of their properties, 1282, 1283.—Of that 5,000*l.* paid to different parties, 4,800*l.* has been paid to the Corporation of Newcastle, 1285.—The Corporation of Newcastle get a profit of from 600*l.* to 700*l.* a year from money so paid, 1286.—But of the 5,600*l.* under the head of river improvement account, 4,400*l.* has been paid for the embankments for making land, leaving therefore in the three years about 1,200*l.* for other works, 1287, 1288.—With the exception of the 1,200*l.*, the whole of the residue has gone to make solid land, in which the conservators have no interest whatever,

STEVENSON, JAMES COCHRANE—*continued.*

1289, 1290.—The treasurer of the Commissioners is the old treasurer of the Corporation of Newcastle. He has not the slightest idea of double entry; he is very accurate in his own way; an accountant had to be employed, since then the accounts have been kept in an unexceptionable way, 1291, 1292.—Witness objects to the system which was transferred bodily from the whole corporation, but not to the conduct of any individuals themselves, 1293.—The new Commission has not worked efficiently, 1294.—Has no objection to the most important works, the piers and the Hay Hole Docks, but the old system is continued all the same as before, as far as the river works are concerned, 1296.—The interests and influence of Newcastle are very considerable and of great importance. There ought to be a control on behalf of the public interests, which are at stake; because the river Tyne is not a private avenue to the Town of Newcastle, but a public highway, and also to arbitrate between those points of disagreement which conflicting views have given rise to; had there been some court of appeal to settle those points upon which there have been disputes, the Commissioners would have heen very much more efficient, 1297, 1298.—All the present Shields Commissioners have at sometime or other expressed themselves in favour of either Admiralty or some other control, which, had they had it, they would by this time have had some complete system of plans and river lines. They would then have been pursuing a straightforward plan, knowing beforehand what they were going to do, and what it was going to cost, with some idea of the future, which at present they certainly have not, 1299–1301.—As a general thing the Commission do not have any detailed estimate or plans and sections of the works going on; gives a case: There were some river works, altering some of the channels above Newcastle, to be adopted. The engineer made a formal report with the estimates; that report was not sustained, because it was thought to go too far, and he was to modify his plans, and get the estimate of the modification; his modified plan and estimate were never produced, the works were thought to be urgent, and I was out-voted at a meeting of the Commissioners, when I moved that the works should not be commenced until the plan and estimates were furnished, and until an arrangement was made with the landowners. The work was ordered to be proceeded with without any plan or estimate, and it was not long before the landowners interfered and put an end to the thing, 1302.—The whole thing must be settled by Parliament, or in some authoritative way, or else it cannot go on at all, 1303.—Mr. Brooks' plan has no soundings upon it, it does not show the depth of the river. Has frequently complained of his not giving plans, showing not only the particular work in question, but the lines of the river on both sides, above and below. In the case of the Hay Hole witness protested against Mr. Brooks bringing forward only a single sheet of this plan, showing only the Hay Hole Dock, and nothing above or below; it was sent up to the Admiralty in that state, and the Admiralty sent it down, wanting the very thing witness had been driving at so long, 1304.—There should be some parliamentary or other power with reference to these foreshore questions. It is an extraordinary thing that a bare majority of this Commission should have the power in any case of alienating for ever from the bed of the river, which is a public freehold, any number of acres of land, perhaps by the casting vote of the chairman, of alienating it so as never to be got back. Such extensive changes, which are now possible, as the fact stands, ought not to be possible, except with the consent of a higher power, 1305.—Witness agrees with the principle of the motion of Mr. Allhusen, but objects to part of it. Of course the land should not be made at all, but if it is made, it should be a source of revenue to the river funds, 1306.—The dredger has not been at work on Hebburn Shoal since the jetties have been extended, 1307.—It has not been there lately, but it was there very shortly after the jetties were extended, 1308.—Does not know of any time that the dredging machine has been used there, except in widening about there. Has no record of it, therefore would not say, 1309.—Should think not, 1310.—Coxlodge is one of the first staiths, 1312.—The water is very deep at Coxlodge. It is widening that it wants there, 1314.—There was a notice given to lessen the number of ships lying about. Witness points out upon the plan the spot referred to in the narrow channel, 1315, 1316.—A public notice was given with regard to the moorings, along the deep, narrow channel north of the Cockcrow Sand, 1317.—

STEVENSON, JAMES COCHRANE—*continued.*

It is half a mile from Hebburn Quay, 1319.—The question as to the lengthening of the jetty at the west end of Hebburn Quay received the sanction of the majority of the Commissioners, but witness was in the minority. Captain Purdo was in the majority, 1320–1322.—The pencil line which was laid down on the map which was shown in reference to Messrs. Palmers' property, was made by a group of Commissioners standing on the quay; the chairman very likely was the man, 1323.—The map belonged to Messrs. Palmer who were making the application. The pencil line was drawn upon the map belonging to Messrs. Palmer, 1324, 1325.—Witness moved long ago that all the Commissioners' reports should be entered in a book, but does not think it has ever been done, 1327.—No doubt Mr. Brooks presented several others, besides the reports mentioned, 1328.—Witness is a chemical manufacturer, 1330.—Has a great deal of refuse stuff to get rid of, for some years deposited on the foreshore of the slake, but now takes it to sea, 1331, 1332.—For some years deposited it within the tidal flow; it did not cover more than three or four acres of the Jarrow Slake, 1333–1335.—It was within the tidal flow; but it is proper to explain that it was carrying out a licence to enclose a part of the slake, which the landlords, under whom the Commissioners hold these works, had obtained many years ago from the corporation of Newcastle. A quay was built, and witness filled up so much under the licence as they had not enclosed. That is a good many years ago, 1336.—Has not put any refuse stuff within the tidal flow for a good many years; cannot give the exact number of years. Should say not within four or five years. Should say four years, to the best of his recollection, 1337–1339.—Erected jetties at the request of the Commissioners at Jarrow Slake, which they wished to be put up to make sure that none of the stuff was scoured away, 1340.—Is not aware that the stuff has gone forward since towards the end of the jetties, 1341.—Has not looked at it lately. It was not so the last time. Has not occupied the property in question lately, 1342.—Has not noticed the jetties lately, 1343.—Has not been there, 1344.—The last time witness was there the stuff had not gone forward towards the end of the jetties. Should be surprised if it had now, 1345, 1346.—The jetties under these gales of wind sometimes get over the quay, and interfere with the stuff, 1347.—A quantity has been washed down to the bottom of the quay, and it has been there for a very long time past. It is hard material, and does not wash into the river, 1348.—There is a heavy run of freshes from the burn, but the stuff is not exposed to it, 1349.—Is acting under licence; came in under lease from Mr. Cookson, 1350.—With regard to landowners getting grants, Mr. Brooks has brought forward once or twice the same sort of thing, and it was entered into and explained, and the Commissioners came down and saw the place, and were satisfied, 1351.—The Commissioners did not require it to be removed, 1352.—The cut referred to was made without authority from the Commissioners, but nothing has been done since the Commission started which has not been authorized by the Commissioners or their engineer, 1353, 1354.—A cut was made up to witness's works through Jarrow Slake, before the Commission started, in the time of the corporation, 1356.—Had no licence to do it; it was merely diverting the channel of a small stream, so as to pass through the slake at a different point from its former course: afterwards that cut, with the consent of the Commissioners, was made navigable, 1357.—The cut was made without the consent of the corporation, 1358.—The piles were driven with the knowledge and consent of the engineer; they were afterwards ordered to be withdrawn, and after that again they were allowed to remain, 1359.—Part were withdrawn, and the rest allowed to remain, 1360.—They are nearly all away now; some have been knocked down by accident and not replaced, 1361.—There was a memorial sent to the Commissioners by some shipowners of South Shields, upon a ridiculous misunderstanding with regard to these piles, 1362.—There was a memorial sent complaining of these piles, 1363.—The memorial was numerously and respectably signed, 1364.—Full-tide walls have been brought into operation on the Ribble, to a certain distance below the town of Preston; but below that again they are considerably below high-water mark, and the extended walls lower down, sanctioned by the late Ribble Navigation Act, are required to be kept very low indeed, 1366.—The existing works witness has described are, for about

STEVENSON, JAMES COCHRANE—*continued.*

a mile below Preston, full tide, 1367.—At spring full tide the existing works are three or four feet below high water, 1368.—The rise of the tide is very considerable, 1369.—Should think it was from 20 to 30 feet. When those walls were laid down they were only half-tide, but in consequence of the great lowering of the bed of the river, giving an increased range of tide, they came nearer high-water mark than they were before, 1370.—By the erection of these walls a large quantity of land has been reclaimed, many hundred acres, in consequence of the fixing of the deep water in a single track, whith formerly used to range about from side to side of a large estuary, and keep a large mass of sand in a constant state of shifting, 1371, 1372.—The Tyne is not at present in the character of a channel, ranging from side to side through masses of sand, and so does not keep up a large quantity of sand in an unnatural state of agitation, 1373.—In the Ribble the channel going from side to side was alternately wasting the banks on each side, which, of course, is not the case in the Tyne, 1374.—Witness attributes the silting up in the Ribble to the fixing of the channel, 1375.—Is aware that by the Ribble Navigation Act of the session before last, it was ordered that a survey should be made of the amount of lands already reclaimed, and compared with the survey which was made before the works commenced, that the accession of land so gained should be vested in the Ribble Navigation Company, and sold at its full value, fixed by arbitration, to the adjoining landowners, and the proceeds applied to the Ribble navigation funds, 1376.—Mr. Rennie's south pier has been all along made the excuse for departing from Mr. Rennie's plan, 1377.—Does not approve of Mr. Rennie's plan of a south pier, 1378.—Approves of the formation of the Jarrow docks. Objects to an unnecessary enclosure of land in addition to the docks, 1379.—Does not believe Mr. Clavers objects to docks; if he does, witness does not agree with him. It is necessary to have docks in the Tyne, 1380, 1381.—The highest payment to the corporation for the conveyance of ballast is 10*d.* At Walker they get 10*d.*, 1383.—Mr. Swinburn, at South Shields, receives 11½*d.*; he does not merely put it behind a wall to make land of it, but he has to put it into waggons and convey it by railway to a considerable distance across the land behind South Shields he deposits it on the sea coast, and has to pay 2½*d.* deposit rent for the privilege of depositing it there. Considers that while Mr. Swinburn has a pretty fair payment, the corporation of Newcastle have a monstrous deal too much, 1384.—With respect to the Sunderland ballast charges, witness was party to a report made to the Tyne Commissioners by the committee of accounts of the cost of dredging. The report was in May 1852, 1385, 1386.—Witness remembers the passage alluded to by Mr. Seymour, 1387.—No contract for taking dredged materials has ever come before the Commissioners, 1388.—There was an offer made to the Commission by two gentlemen to convey ballast from Shields in hopper barges. Nothing came of it; there was nothing done, 1389.—The offer was made on the 12th of October, 1853, should say a year and a half after the report, 1390, 1391.—They offered to carry out the ballast to sea by means of hopper barges from ships in Shields Harbour, at the rate of 11*d.* per ton, 1392.—Witness had nothing whatever to do with the proposition, 1393.—This proposition was made to the Commissioners; it was made to the chairman of the Ballast Committee, 1395, 1396.—Witness is a member of the Ballast Committee. Remembers the proposition coming before the Ballast Committee. Thinks it was declined, 1397–1399.—Cannot say whether it was made to the chairman of the Ballast Committee, or the chairman of the Commissioners; it came before the Committee, 1400, 1401.—The following resolution was come to on the 12th of October 1853, Mr. Ridley acting as chairman of the Committee: "The Police " and Ballast Committee recommend the Commis- " sioners to accept the annexed proposal for conveying " ballast to sea, and to grant Messrs. Stevenson and " Company a licence to carry out their object, subject " to such regulations as the Committee may deem " necessary from time to time," 1403.—It was accepted by the Committee. Witness was present; it was in 1853, 1404–1406.—Has something to do with the newspaper at Shields, but is not the proprietor, 1408.—The paper has commented upon the proceedings of the Commission from time to time, 1409.—Mr. Comrie made soundings in 1849 for Mr. Rendel, 1411.—Mr. Rendel's plan with the soundings was in the engineer's

STEVENSON, JAMES COCHRANE—*continued.*

office; the tidal observations referred to were not, 1412.—There was a diagram of two tides, but the extended series of tidal observations which was taken for many weeks together in 1849 have frequently been asked for and have never been produced; it has been stated that they never have been got from Mr. Rendel, and witness moved from time to time that they should be got; from time to time Mr. Clayton undertook to get them; witness has not seen them yet, 1413,—Does not know whether they are in the office now; they were there the last time witness asked, 1414.—Mr. Brooks never told witness they were in the office, 1415.—Captain Purdo told witness he had seen some observations, but witness does not know whether they were those of Mr. Comrie, if they are they have come lately, 1416.—It was part of witness's wish that the Trinity tide gauge should be employed as one of the series, but tidal observations cannot be made from one tide gauge, 1418.—There was one tide gauge erected belonging to Trinity House, to which witness had access; but, of course, one is of no use; witness urged the erection of another till he was tired, 1419–1421.—Does not think he made any specific motion, 1422.—It is more costly to take the ballast out of ships than to raise it by the dredger, 1423.—It costs 2½*d.* a ton to fill it into tubs at the ballast engine, 1424–1426.—Ballast cannot be taken out to sea in hopper barges when the sea is breaking across the bar, 1427.—The Act of Parliament requires it to be taken two miles beyond the bar, in ten fathoms of water; of course that will enter into the calculation of the cost; but the real difficulty in stormy weather is in crossing the bar; when once across, the additional distance is immaterial, 1429.—At Sunderland, those parties who take ship ballast in winter lay it upon a quay; they take an opportunity in summer to take it to sea, 1430.—They sometimes dredge all the winter in Sunderland; there is more interruption on account of the sea, 1431.—Witness is an alkali manufacturer, 1432.—Does not pretend to any engineering opinions as an engineer at all, 1433.—Taking ballast from ships is much more expensive than dredging; one reason is that the cost per ton depends upon the quantity taken. There are fixed expenses, whether the quantity is large or small; now in dredging, the hopper barge is laid alongside the dredging machine, the stuff is poured into it without ever being handled, and calculating the cost upon the average of a year's cost, they give very different results in the one case from the other, 1434.—There is nothing in common excepting merely the conveying hopper and the power to take it out, 1435.—The only diagrams witness saw were diagrams of two tides, a spring tide and a neap tide, 1436, 1437.—Has no doubt they were used by Mr. Rendel to enable him to form his opinion as to the amount of obstruction to the progress of the tidal wave which the different features of the navigation presented, 1438.—Has no idea why those two tides were selected; it was Mr. Rendel's doing, 1439.—Thinks Mr. Clayton has these tidal diagrams now, 1441.—Presumes the clause in the Ribble Company Act about the reclaimed land becoming the property of the navigation was the same kind of arrangement as was contemplated in Mr. Allhusen's motion, and which witness approved of, 1442.—Thinks that the improvement of the river has been much retarded by the disputes and litigation which have taken place between Newcastle and Shields, 1443.—It is desirable that the cause of these disputes should cease, 1444.—Merely forgetting things which still exist is not the way to promote peace; it is to remove the cause of the want of harmony, and one of these is the hostile interests of the corporation of Newcastle, which still commands a majority in the River Commission with regard to several questions; the coal due, for instance, and the acquirement of land opposite their estates, 1445.—The Commission can only recommend to the Legislature. The moral influence of the Commissioners' report might be so great as to prevent any opposition, 1446.—Thinks the existing arrangement for the management of river affairs is an improvement upon the ancient state of matters in reference to the constitution of the board; is decidedly of opinion that there should be an equal number of representatives from both ends of the river, with the power of appealing, in case of difference, to some independent central authority, 1447.—The plan witness has before referred to has been present at the meetings of the Commissioners, but it has not been unrolled in the way it ought to have been; that is not the kind of plan which was wished for; the plan which is used shows no

STEVENSON, JAMES COCHRANE—*continued.*

soundings and no sections. The question of the transverse sections of the River Tyne, as affected by the works in progress, is much more important than the mere question of depth, and that has never been brought before them in a satisfactory way, 1450.—Of course, this plan is not the only one witness was dependent on in making his own inquiries. He had a reduced copy of Mr. Calver's survey. Has never brought forward as a substantive motion that the plan should always be produced at full length at every meeting, 1451.—Does not impute any design of concealment; turned it up when he wished it himself, of course, 1452, 1453.—Witness always endeavours to satisfy himself on these points, but it is quite impossible, unless the engineer of his own accord brings forward those things in the way that the Commission could wish, that they can, by any mere resolution of theirs, procure what they want, 1454.—The plan has always been brought to the views of the Commissioners, 1455.—Those who took the trouble to have it opened had full access to the plan at all the meetings, 1456.—Witness thought it worth the trouble, but has not been pertinacious enough in insisting upon its being folded out, 1457.—A landowner is not licensed to receive ballast in front of his land until he has a license from the River Commissioners, 1458.—Before he can have the ground filled, even out to the river line, as settled by the Commissioners, must obtain permission from the Commissioners, 1459.—The only case in which a fresh ballast license has been granted to parties to deposit in the bed of the river has been to Messrs. Palmer, 1460.—By a fresh license witness means since 1850, 1461.—There are not many owners of frontage down the river from Newcastle to Shields who have space to be filled up. The Dean and Chapter at Wallsend, the River Commissioners themselves, have a property at Howdon, the present wall of which is within the line; and on the south side Mr. Ellison's is the only property such as referred to, 1462.—All between Hebburn Quay and Black Staith is Mr. Ellison's, 1463.—Mr. Ellison, the corporation, and the Dean and Chapter, own the great bulk of the frontage which yet remains to be filled out to the river line, 1464.—The Duke of Northumberland's frontage is mostly in the Hay Hole Dock, that is settled, 1465, 1466.—It is only below Bill Point that there is any question, 1467.—Just above Bill Point, on the north side, belongs to the corporation of Newcastle, 1468.—Should say that nine tenths of the ground from Bill Point downwards, yet remaining to be filled, belongs to one of those three parties, 1469.—The licenses spoken of are licenses for the deposit of ballast, not for the filling out of land. If the system is carried on which has been hitherto pursued, it will all ultimately be filled up with ballast, 1470.—Is an advocate for half-tide training walls, and that the water should ever after be allowed to flow over the wall and up to the old high-water mark, 1471.—The injury to a frontage is not of any moment, except where there have been quays already existing on the shore; and for the greater part of Mr. Ellison's property, and of the Dean and Chapter's property, thinks there are very few, if any, quays and manufactories at all along the high-water margin, so that no practical injury would be done by putting a half-tide wall in front, 1472.—Of course the water frontage, and access to that water frontage, would be affected by the formation of a half-tide wall at some distance outside it, 1473.—This system involves the question of compensation for the frontage. The compensation might be effected by putting viaducts over the mud bank between the high-water mark and the half-tide wall, and terminating at a wharf on piles by the water margin, 1474.—The compensation in many places down the river might amount to very large sums of money; but if the opinion is correct that the maintenance of the lower reaches of the river depends upon the quantity of tidal water passing them, then that must take place whatever it costs, 1475.—The mere direction of river lines, where they should run, was not so difficult a question as the dispute as to the principle upon which they should be made; and the object of those who took the same view of the case as witness, was to put an arrest in the meantime upon the system which was going on of making full-tide walls. Would have arrested their going on in order to clear the way for a fair settlement for whatever system might be most approved, 1476.—There is no plan which has been carried out as a whole. 1477.—The mooring fund was nearly all laid out in Shields Harbour, but it is a tax upon the shipping,

STEVENSON, JAMES COCHRANE—*continued.*

and was laid out where the largest number of vessels lay, and where it was most needed; it was a distinct tax, and at the disposal of the Commissioners; it was laid out where it was most wanted. and there was no choice whatever, 1478–1481.

STORY, WILLIAM. (*Analysis of his Evidence.*)—Is a river pilot, 3165.—From Newcastle bridge to Shields, 3166.—Has been in that service 17 years, 3167.—The present condition of the river is very much improved, as to the depth of water, as well as the general condition of the channel, 3168, 3169.—Remembers Tyne Main Shoal, 3170.—When first a pilot, there was 2½ feet depth, 3171.—There is now 6½ or 7 feet, 3172.—Remembers Hebburn Shoal, 3173.—It was at that time very bad, 3174.—Very often vessels got stranded or stuck there, 3175.—Its condition is now very good, 3176.—Passing along that channel at high water spring tide, gets about 16 or 16½ feet, 3177, 3178.—Knows where Killingworth Shoal was, 3179.—Its present condition is very good, better than Hebburn, 3181.—Remembers Howdon Shoal. Above 7 years ago it was very bad, 3182, 3183.—At present the depth at high-water spring tides is about 18 or 18½ feet, 3184, 3185.—Remembers Howdon Shoal as far back as 1832 or 1833, 3186.—There might be then about 4 feet depth at low water time; there was 15 feet at high water, 3187.—There is now 18½ feet, 3188.—It was 17 years ago that Tyne Main Shoal was so very bad, 3189.—It has been gradually getting better since, 3190, 3191.—Ships are not sailed, they are generally towed, 3192.—They are now taken down by steam, 3193.—Is appointed by the Newcastle Trinity Board, 3194, 3195.—The Killingworth Shoal was bad 17 years ago, 3196.—It has been getting better gradually ever since, 3197.—Mr. Brooks has put some jetties out at Killingworth, 3198.—Not far into the river, 3199.—Knows Killingworth Staith, 3200.—It has come a long way out into the river, 3201.—It has been lengthened within witness's memory, 3202.—Cannot correctly say the distance, 3203.—100 feet good; may be 200 feet, 3204, 3205.—Howdon Shoal was bad at the same time, but it all improved after that time, 3206.—In the neighbourhood of Hay Hole there is a different course from what it used to be, 3207.—Witness goes now by Bill Point and Whitehill too, which his predecessor did not do, 3208, 3209.—Those points have been cut off, which, with Mr. Brooks' jetty, has considerably improved the channel, 3210, 3211.—The jetty is not brought out so far as Bill Point, 3212.—Mr. Brooks has cut off Bill Point above water, 3213, 3214.—Below water it is as it was 17 years ago, 3215.—He has brought his jetties out to it, 3216.—He has brought them out to Bill Point, and not cut off Bill Point, to make the channel straighter. At that time had to go right in by the quay, 3217.—Remembers the removal of the surface of the soil in the neighbourhood of Bill Point, but does not know the expense, 3219.—It was about 11 or 12 years ago, 3220.—They took away a great mound of land above Bill Point, 3221.—Nothing has been done beneath the surface of the water, 3222.—The ships are seen decidedly further in coming round than before, 3223.—There was almost a mountain of earth taken away inland, 3224.—It would have been a great improvement to the sailing channel if they had removed the rock and earth below the surface of the water as far back as they took away the earth on the top, 3225.—Cannot say that Mr. Brook's plan to take off Whitehill Point several hundred feet within the present staiths would be a great improvement to the channel, 3226, 3227.—It is now straight up and down, 3228.—Killingworth Shoal was in a bad condition so late as 1845. The depth at low-water spring tides was then 2½ or 3 feet, 3229, 3230.—Cutting off the mound of earth before spoken of has rendered the navigation a great deal less dangerous than it was before, 3231.

ST. PETER'S QUAY:

Opposite St. Peter's Quay in its natural state the width would be about 650 feet, *Brooks*, 4784.

STRAKER, JOSEPH, Esq. (*Analysis of his Evidence.*)—Is a shipowner, merchant, and coal owner, 1.—Has known the port of the Tyne for 50 or 60 years, 2.—Has taken an active part in all attempts at improvement that have been made in the Tyne, 3.—Is one of the Commissioners under the Tyne Improvement Act, 4.—Resides at North Shields, 5.—Is appointed as the

STRAKER, JOSEPH—*continued.*

representative of that port, 6.—Was a member of the North and South Shields Committee of 1848 that promoted the Conservancy Bill, 8.—There were committees both at North and South Shields, 9.—Attended the meetings of the Committee in Parliament, and gave evidence on the Bill, 10.—Was also examined before Captain Washington, on the Admiralty inquiry, 11.—Mr. Rennie's lines of 1813 are marked red on the plan, exhibited before the Committees of the Lords and Commons, 12, 13.—The first encroachment upon the river commenced at the lower groin, just opposite Howdon, 14.—There is a considerable encroachment called Willington Quay, 15, 16.—The effect of it was in the first instance to cause an eddy below it to silt up the dock immediately below it, and to interfere very much with the staiths below, with the shipping places at Hay Hole, 17.—It was made by the corporation of Newcastle, 18.—Thinks it was made before 1849, 19.—It has been going on ever since, and is now nearly, but not quite, complete, 20.—Points out on the plan the position of the encroachment complained of, 21.—The effect of it was that it silted up this dock (pointing it out) and shoaled the loading berths so much that the dredger was employed for months to keep the channel open. So sensible were the corporation of that effect that they cut off the point, and threw it back; so that at the present moment believes it is on Mr. Rennie's lines, allowing the ebb of the tide a freer course down the river. An attempt was made by the engineer to obviate that, by carrying out works on the south side of the river, to restore the current of the river, and to throw it across to Hay Hole. That has now been removed, so that the line is now uniform on both sides, 22.—Thinks that Mr. Calver's plan shows the state of things, but does not show Mr. Rennie's lines, 23–25.—As the Willington Quay was first constructed, it was constructed beyond Mr. Rennie's line, the effect of which was injurious, and led to its being altered, 26, 27.—The effect of the alteration on the north side, and the absence of a regular wall on the south side, on the Hay Hole, was to silt it up, and to cause a great expense to the Commission in dredging, 28, 29.—Since that, docks have been sanctioned under an Act of Parliament in Hay Hole, 30.—Should say they were rendered necessary by the silting up, and the irregular encroachment on Willington Quay, 31.—The present state of the quay is this: where frontages have been let off to private individuals they have been made to form proper quays to protect the ballast and material behind them; but where it still remains in the hands of the corporation there is merely a rubble wall, made of any hard material they could easily come at, 32.—Witness's attention has been constantly directed to the state of Shields Harbour for the last half century. Fifty years ago was captain of a ship drawing from fourteen to fourteen and a half feet of water, trading to this port; generally discharged his cargo in Dent's Hole. Never attempted to go higher up the river with her. Is not, therefore, prepared to say whether she could have proceeded to Newcastle Quay, but thinks not, 33.—Believes the statement in Mr. Armstrong's pamphlet of 1836, that the Tyne at that time afforded the advantage of bringing up vessels to the quay, drawing fourteen to fourteen and a half feet water, is perfectly correct, 34, 35.—Knew the river long before that time, 36.—Commanded a ship for nine years, and then took a graving dock in South Shields, and a building yard, and continued in that for several years; and from that time has been a shipowner, 37.—Should say that the bar is much in the same state as it was with respect to depth. Has been told that it is contracted in breadth, 38, 39.—The bar is subject to considerable variations from natural causes, quite independent of the quantity of water coming in and out, 40.—Thinks the bar has varied from those causes alone, from time to time, perhaps a foot, 41.—With respect to the narrows, though it has always been called a deep channel, and must remain deep, the breadth of it has diminished considerably in witness's time, 42.—Could only attribute it to the quantity and force of the water seeking a passage to the sea; but does not pretend to say whether that is the real and only cause, 43.—Within witness's experience there has been such an interference with the sides of the river as to amount to a considerable abstraction of tidal water, 44.—The state of the depth of water in Shields Harbour varies very much; the greater crowd of ships you collect the better state the harbour is in, 45, 46.—Should say the ships do not

STRAKER, JOSEPH—*continued.*

produce any effect in obstructing the amount of water either flowing in or out, 47.—Considers that the bar is a thing of the first consideration, and that anything which tends to contract or lessen its depth of water is to be most carefully avoided, 48.—Concurs with the passage in Mr. Rendel's report, referring to the importance of lengthening the time of the tide for the passage of vessels across the bar, 49, 50.—Thinks that the operations ought to be mainly directed to deepening the channel, and increasing its breadth, 51.—The making of the bar as deep as possible is of more importance than the depth of water at Newcastle Quay, 52.—The course of business is such that the larger ships have to discharge and seek their cargo in Shields Harbour. A great many ships never come higher than Shields Harbour, 53.—It is only of late years that Shields has been made an independent port, 54.—It was a matter about which the Shields people took a great deal of interest, and was obtained with great difficulty, 56, 57.—It was one of the first steps of emancipation from Newcastle, 58.—Concurs in the views expressed in the reports of Mr. Rennie and Mr. Rendel. Believes them to be suhstantially the same, 59, 60.—Is of opinion that the river should have been treated as one great whole measure, which should have been commenced at the bar and worked upwards, 61.—With the exception of a few stones which were removed where previously there was a dangerous shoal, does not know of any work between Whitehill Point and the bar that has been done, 62.—Thinks that that was the spot of which the engineers of the conservators did not know the existence at the time of the committees in Parliament in 1849, 63.—Does not think there was any place completed excepting Newcastle Quay by the corporation of Newcastle, the then conservators, before 1850, 64–67.—Remembers Mr. Armstrong's evidence being given before the Committee of the House of Commons, and that it was treated rather as a joke, that the corporation of Newcastle should spend money anywhere excepting at Newcastle, 68–70.—Since the new conservancy has come into operation, the same system has been pursued, 71.—The management has been substantially in the same hands, 72.—This results from a part of the Commissioners being composed of members of the Newcastle corporation, who have been always able to carry a majority in the Commission, 73.—Considers it the first consideration to keep the mouth of the harbour clear, and to keep deep water there, 75.—The amount of tidal water has been diminished, from the enclosing of portions of the river, and forming it into solid land, instead of using half-tide walls, as recommended by Mr. Rennie and Mr. Rendel, 76, 77.—Is decidedly in favour of docks, wherever they can be procured, 78.—Would even sacrifice a little of the tidal space for the purpose of obtaining docks, but can see no necessity for making full-tide embankments and solid land, when the same object can be obtained by half-tide training walls, 79.—The result of the use of the half-tide walls is, that it leaves a tidal volume to return, 80.—Thinks the operation would be in time to fill up the top of that half-tide wall. States the advantages that would arise, 81.—The 445 acres, which Mr. Rennie recommended to be left at the back of the half-tide walls, would have left a considerable extent of berthage for the object mentioned. Looks forward to the time when some of the places will be valuable to form docks, 82.—Is of opinion that full-tide walls ought never to have been allowed to abstract land to any extent, except for docks, or for some great commercial purpose, and under Parliamentary or Admiralty control,83,84.—Is of opinion that the system of half-tide walls would have admitted of their dredging out from the channel, and placing the materials behind those walls, so as to have made a good channel, and secured the material there as the works went on. They are now getting a new dredger. The river will require a great deal of dredging. It is proposed to get hopper barges to carry the material to sea; but if a gale of wind comes on, and there is a high sea upon the bar, how are the hopper barges to get to sea? Therefore it is the more necessary that such places should be left for the deposit of the dredged material when these hopper barges cannot be carried out to sea, 85.—There have been considerable discussions at the meetings of the Commissioners as to the propriety of adopting a system of hopper barges, 86.—It has been reported upon by Mr. Stevenson, 87.—Looks to that, and also to the deposit in bad weather, as two systems for disposing of the ballast that the Commissioners

STRAKER, JOSEPH—*continued.*

ought to have at their disposal, 88.—Considers it of importance, with reference to the ballast question, that all these spaces should have been left in the control of the Commissioners for the purpose of ballast of the dredged materials, 89.—Remembers the case of the Sardinian frigate a short time ago, 91.—Has heard from Mr. Smith, the builder, that she drew 16 feet of water. A dredger was employed for her to get down to Shields. Thinks she lay about three months before she could be got down to Shields, 92.—Has heard 20,000 tons were dredged, 93.—Knows of his own knowledge that the bed has lowered at three portions of the river, 95.—Has never been able to procure any general plan or section of the river with systematic soundings, which would enable witness to form an accurate opinion of the state of the river at different times, 96.—The dredging of Tyne Main shoal was the principal improvement between Dent's Hole and Newcastle Quay. Knew it for twenty-five years as an impediment between those parts, 97.—It was first dredged by Mr. Danson, the harbour master, and afterwards by Mr. Brooks, 98.—Thinks the dredging was commenced before Mr. Brooks was engineer to the conservators, 99.—There has also been dredging in Pelaw and Hebburn shoals, 100.—Groins or jetties were placed at Pelaw, 101.—Always considered that they were the most mischievous things that could be placed upon the river, 102.—There have been a great many discussions at the Conservancy Board upon the subject of the transverse groins and jetties, 103.—Has invariably taken a course adverse to them, 104.—As regards Pelaw, is of opinion that they did not answer, 105.—Is of opinion that the effect of these jetties is invariably to make a hole in one place and transfer the sand to another, 106, 107.—Notwithstanding these jetties at Pelaw, dredging was necessary, 108.—Was speaking of the Hebburn jetties, 109.—They did not answer the purpose intended to the extent which they were led to suppose they would by Mr. Brooks, 110.—A considerable time after the jetties were put out, Mr. Brooks applied to lengthen the jetties. He found he had made them insufficient in the state they were in, and he applied to have them lengthened. Witness opposed that; but he succeeded in getting leave to lengthen them. After being so lengthened, he came back to the Commission to require the use of the dredger to do the thing which he was to have done by the lengthening of those jetties, and he was granted the use of the dredger; therefore witness attributes to the dredger whatever has been done in the channel, and not to the jetties, 111.—Does not mean to say that jetties have not had effect in some particular places; but whatever improvements have taken place have been principally by dredging and not by jetties, 112.—Wherever you put a cross jetty it tends to make solid land of it, especially if it is a high full-tide jetty, 113.—In those places where jetties have been placed half-tide walls ought to have been placed, and the material, if dredged, placed behind them, 114.—Has opposed jetties ever since December 1851, when they were first proposed, 115.—Is aware of the advice of Mr. Rennie and Mr. Rendel, as regards Bill Point, 119.—Instead of cutting off the point, the groins have been carried out to the extent that the point was before, thereby confirming the existence of the point instead of removing it, 120.—Has frequently taken part in the motions against dealing with ballast in the way that has been done, 121.—Large quantities of ballast, for which the Commissioners have paid for a place of deposit being provided, have been washed into the Tyne, and must continue to do so while unprotected except by those chalk walls, 122.—Believes the Corporation at the present moment receive 10*d.* a ton from the conservators for providing a place of deposit for ballast, 123.—Knows that they receive a sum of money per ton from the conservators, and make a considerable profit upon it, 125.—That will appear by the accounts, 126.—Remembers Mr. Popplewell objecting at the Board of the Commissioners to the sum which the Corporation received for ballast, 127.—That objection was overruled, 128.—They have continued to receive it from the conservators, 129.—The place of deposit, within which the Corporation place this ballast, is upon land that was part of the tidal area, 130.—Perfectly remembers the various applications that were made, and discussions that took place, respecting the encroachments of Palmer and Brothers, and Bowes and Company, near Jarrow Quay. After a resolution had been come to by the Commissioners, that a half-tide wall only should be continued from

STRAKER, JOSEPH—*continued.*

Hebburn Quay down to Jarrow, the half-tide wall, after being formed near to Palmer's, was observed not to depress its level as the creeping of the collieries occasioned, but to be rising out of the water in the most extraordinary manner. Mr. Brooks was asked how this arose. Mr. Brooks knew nothing about it; if it was so, it was with Palmer and Co. They pleaded innocent of the whole matter. But when the Commissioners went down in a body to inquire into the matter, and Mr. Brooks was brought face to face with Messrs. Palmer and Co., they told him that he had raised the wall and not they; and he could not deny the fact. And Mr. Brooks further said that it was his wish and intention to make solid land of it, 132.—The Commissioners put a stop to the encroachment, excepting the five acres and nine tenths, or some such quantity, pointed out at the lower end of the quay, which had been granted previously to them, 133.—Remembers Mr. Allhusen's motion, respecting the foreshore rights claimed by the Corporation, to the effect that, if made into land at all the value of such land should be proceeds applicable to the general conservancy purposes, 134.—Concurs in that opinion, 135.—As matters now stand, there are instances in which the Corporation and landowners have interests conflicting with the interests of the conservancy of the river, 136.—Is of opinion that the Conservancy Commission, since its establishment in 1850, has neither worked efficiently nor for the objects contemplated when the Act passed, 137.—Was the party who signed the letter; acted generally in the minority, 138.—Has invariably voted for the benefit of the river, 139.—Has no interest except the general advantage of the public and the port, 140.—The letter to Sir James Graham and the memorial were perfectly bonâ fide, and dictated by what witness believed to be the real interests of the conservancy of the port, 141.—The coal trade of the port is increasing very considerably, 142.—The portions of land within the half-tide walls between them and the foreshore is an important space that might hereafter be required by the coal trade or any other purpose, 143.—The first encroachment at Willington Quay was commenced in Mr. Anderson's time, 144, 145.—Thinks it was about 1838 or 1839, 146.—The effect of it was to create an eddy below, and to silt up the docks, 147.—Afterwards when Mr. Brooks became the Corporation engineer, he persevered in making those works higher up the river, so as to counteract that effect, 148.—Does not think that the formation of any docks in the area of those encroachments was contemplated at the time that the works at Willington Quay were commenced, 150–152.—The formation of the docks has been encouraged by the present conservators of the Tyne, 153.—Under the present system, now that the docks have been made, the costs would fall upon the Dock Company, 155, 156.—Not upon the funds of the conservators, 157.—They are not strictly on the line of Mr. Rennie; they are further out, 158.—The conservators are relieved from this expense; the docks have been required by the projections made above, 159.—Considers the docks a very great improvement, 160.—Witness used to discharge the cargo of a ship of fourteen and a half feet of water at Dent's Hole, 161.—Could only get over Hebburn shoal at top water. At that time there were no steamboats, now there are nearly 200 steam-tugs on the river; so that at this moment a ship can be towed from Shields to the shoalest part of the river at the exact point of high water; considers that tantamount to six or twelve inches of a ship sailing up, 164.—Witness points out on a plan the channel which he went along with his ship, 165.—The channel would be materially altered if the plan of Mr. Rennie was acted upon, 166.—The Newcastle traders have increased in size, 167–168.—They have all to cross the bar before entering the harbour; but those traders so going up to Newcastle Quay do not carry the whole of their cargoes from Newcastle, when loaded. They leave Newcastle Quay generally in ballast, and come down to South Shields and load. Therefore you might have a ship of double the size trading there in that way, 169.—Wherever you can deepen the harbour, it must be an advantage to all parties, 170.—The state of the tide at the bar and at Newcastle Quay is not the same at the same time, 171.—A ship leaving Newcastle will have to cross the bar later in the state of the tide, as a general rule, than the ships leaving Shields Harbour, 172.—A ship going from Newcastle comes down to South Shields to load, consequently she has the very same opportunity of crossing the bar with a ship at

STRAKER, JOSEPH—*continued.*

Shields, because she is at Shields. For instance, the Newcastle traders, though increased considerably in size, load at Shields; they do not load at Newcastle, 173–175.—Can only imagine one way in which it would be more to the interest of Newcastle than Shields to have a deep bar. If it were possible (which it is not) to make it of one uniform depth from Shields to Newcastle, then it would be more the interest of the parties furthest removed from the bar than of those near it, 176–178.—Does not believe any engineer thinks it may be, 179, 180.—Does not think there can ever be the same depth of water up the river as is on the bar, 181, 182.—Should say the difference at present is twenty-four feet on Shields bar, and fifteen feet up the river, 183.—Knows it from having seen ships water-marks, and having navigated a ship himself, 184.—It is thirty years since witness navigated a ship himself, 186.—Has more experience now than he had then, 187.—Has known the depth of water on the bar to be only twenty-one feet, 188.—Thinks last summer was a dry summer, 189.—Though unable to give the opinion which an engineer ought to give, thinks it quite reasonable to suppose, that after moving about the river for fifty or sixty years, he must have opinions on some points even superior to an engineer, 190.—Thinks the works should be commenced at the bar and worked upwards; it would answer the same purpose to begin at the centre or commencement of the river, 191, 192.—Very likely it may be the opinion of engineers, that one influence which might be brought to bear upon the bar would be an increased energy of the tidal flow by improving the state of the channel higher up the river. If that be so, that would be a reason why they should not commence at the harbour, 194, 195.—Was in the Clyde when the first ship from India went up, 196.—Knew the Clyde when there was six or seven feet water, and knew it when the first East Indiaman went up. Has had ships there himself, 197.—No money has been expended except at Newcastle, 198.—Between Whitehill Point and the bar not one shilling has been expended, with the exception of removing a few stones within the bar, 199.—No money was spent between Whitehill Point and Shields Harbour, the bar, 200.—Is quite aware that in the Willington improvements, in those groins and in all those things, money was expended, but for what purpose? Not for the benefit of the river, 201.—Since the present Commissioners have become conservators of the river they have expended money in dredging in front of Newcastle Quay; upon the quay itself they could not lay money out, 203.—Just previously to the formation of the present conservancy, the whole of Newcastle Quay was rebuilt at the expense of the conservancy, at a cost of 60,000*l.* or 70,000*l.*, at the expense of the river fund, 204, 205.—Does not recollect that the present Commissioners have expended any money at Newcastle, excepting for dredging in front of the quay, 206.—Objects to full-tide walls because the same object could be effected by half-tide walls, 208, 209.—Considers that a half-tide wall answers all the purpose of directing the current of the river in the proper channel without depriving the lower part of the harbour of the benefit of the scour of the water behind it, 210.—In time they would fill up to the level of the half-tide walls, 211–213.—Would recommend a half-tide wall as a general rule on the river, 214.—It would not require dredging or sweeping machines to keep the level at the half-tide walls, 215.—The tendency would not be to get the elevation higher, 216.—Mud would accumulate to the top of the half-tide wall, and no higher, 217, 218.—The current would be stronger, 219.—With every breeze of wind, there is a certain lipper acting over the top of the half-tide wall, which washes off the mud, and what accumulates one tide washes off the next; the very action of the steamers going up and down the river causes this; it will be washed down level with the top of that wall, and will go no higher, 220.—Would never have raised an objection to filling up the encroachments of the river with the dredgings from the river, provided it had been properly done, because every ton taken out of the river gives a ton of water in its place, 221, 222.—The frontage of the river becomes an important interest to the landowners, 223.—Refers to Mr. Leslie's building yards, as an instance of the effect of the half-tide walls. Proposed to the Commission that instead of allowing Mr. Leslie to carry that red mark out to the half-tide wall, and to fill it up with ballast, that he should be made to build his ship upon land, and that there should be a half-tide wall for him to launch his ship through,

STRAKER, JOSEPH—*continued.*

224.—There was all the natural depth of water which Mr. Leslie had ever had, except that it was injured by the groin immediately above it, which had silted it up in part, otherwise there was the natural bank of the river for him to build on, 225, 226.—If Mr. Leslie choose to pitch upon a shoal part of the river upon which to build his ship, he must put up with the inconvenience. It is no consideration of the conservators how he is to find water to launch his ship; that is his look-out before he chooses his yard, 227–229.—There is plenty of deep water along the river where a ship may be built, 230.—Supposing instead of a half-tide wall, the full-tide principle had been carried out, he must have carried his ship-building operations close down to the full-tide wall, and he must have taken down so much of the frontage as to allow him to launch into the river, 231, 232.—The Tyne main shoal was removed by the dredger, and not by the aid of any river works, 233–235.—Speaks generally of all jetties as being mischievous, 236.—The Hebburn shoal has been in a great measure removed, and it has caused another shoal lower down. Part of the shoal was removed very readily by the effect of the narrowing of the river there, and brought down to the red line, where it deposited itself, and nearly made a bar across the river for a considerable time, 237.—Part of the Hebburn shoal was removed, and part remains yet, 239.—That was after the jetties were put up, 240.—The shoal is shown on Mr. Rennie's map, 241.—Mr. Brooks got the jetties lengthened, and then got the dredger, 242.—Dares say there was dredging before the jetties were put up, 243.—There were efforts made to remove the shoal by dredging before the jetties were erected, but not constantly, 244, 245.—The efforts were successful to a certain extent, 246.—They did not remove the shoal, and it is not removed yet, 247.—It has not been substantially removed, 248.—Thinks the grievance has not been much reduced; it has been shifted lower down, 249.—[The witness here points out where in his opinion the Hebburn shoal was,] a great portion of it is removed, and carried further down the river, 252, 253.—Steamers used very constantly to get aground on that shoal, 254.—Has often stuck there for half an hour or an hour. It was not the only place on the river they used to stick, 255, 256.—Was down the river very recently with the Commissioners near the place where the shoal has been removed, 257, 258.—Mr. Brooks seems to have had considerable doubts as to whether the steamer drawing five to five and a half feet of water, which was ordered to convey them, would have water down, and got another with less water, 260.—Has not been down in the same steamer at dead low water, 261–263.—Passed over the place where the shoal was removed to at nearly low water, 264, 265.—Was told by one party that the steamer was five feet, but Mr. Brooks said five feet six inches, 266, 267.—Remembers a return being moved for of the quantity of dredging that had been done, but cannot speak to the particulars of it, 268.—Mr. Leslie came to this spot so recently that the place is not completed yet, 269, 270.—If the half-tide wall had been made, and nothing behind it but the dredging, Mr. Leslie would have been no worse for the purpose of ship-building than if he had built his ships upon his own land, 271.—Remembers Mr. Rayne's motion that no ballast should be deposited behind the groins except chalk, and chalk rubbish, and ballast dredged from the river, 272,—Thinks Mr. Rayne either withdrew the motion altogether, or altered it, 273.—It was never followed up; no good came of it, 274, 275.—Has no difficulty in pointing out the part of the river answering to this description, "To be let on lease, for either long "or short terms of years, the lands forming the river "frontage of Jarrow Grange and Hebburn Estates, "(on the south bank of the River Tyne,) extending "westward from Messrs. Palmer's iron ship-building "works to within a short distance of the Pelaw Main "Staiths. This property is well situated for iron ship-"building, and for manufacturing purposes generally, "having a good depth of water in front, with a rail-"way communication behind. Further particulars may "be obtained on application to Mr. Foster Whitehouse, "or at 192, High Street, Gateshead," which appeared in a Newcastle paper of September 1853, 276.—Believes Mr. Forster is a land agent, 277, 278.—Does not know anything of Mr. Ellison or Mr. Leslie personally, 279.—Money had been expended at Willington, not for the benefit of the river, but for the benefit of the Corporation, 280, 282.—Knows that part of the terms which they were obliged to concede to in the Tyne Act, 1850, was the liability the Conservancy had taken upon themselves in respect of previous works, 283, 284.—The system of treating the river as part of a whole has not been followed at any time, 286.—Remembers the inquiry before Mr. Walker about the Hay Hole Docks, 288.—Remembers this statement being made by the Town Clerk: "The parties shipping their coals in that "bay, who are lessees of his Grace the Duke of North-"umberland, had already begun to feel the prejudicial "effects of that alteration in the channel of the river "which had been projected by Mr. Rennie; and the "consequence was, the introduction into the Bill of "1850 of a clause by which there is saved to his Grace "the Duke of Northumberland any right of his Grace, "his heirs, successors, or assigns, to prefer, commence, "or prosecute any proceedings or claims which he or "they may be advised to prefer, commence, or prose-"cute in respect of the damage, if any, which may "have accrued, or which may hereafter accrue to his "Grace, his heirs, successors, or assigns," 289.—The clause which "throws upon the conservators the bur-den of the acts of the previous conservators," had general reference to all acts, 290.—When Mr. Clayton referred to the consequences which rendered the docks at Hay Hole necessary, thought this Willington Quay was one of them, 291.—Thinks that the improvement of the river has been very much retarded by the disputes and litigation between Newcastle and Shields, 292.—Thinks it is very desirable that these disputes should now cease, 293.—Is not aware exactly of what the course of this Commission will be, 295.—Quite agrees that if they could agree among themselves it would be much better than going to Parliament, 297—Is sorry to say that he should prefer a royal conservator, 298.—The river line from Shields to Newcastle was agreed to. Was on the Committee on those lines. Mr. Rennie recommended a river line, and it was agreed to. Thinks it was before this Commission was appointed, 299.—The committee agreed to those lines, but like most of their other agreements it never produced any result. Mr. Brooks was instructed to mark down the lines distinctly on a plan, but it has not been done, 300.—Mr. Brooks received those instructions on the 17th August last, 301.—Does not think the agreement about the lines has ever been brought formally before the Commissioners, 302.—Fifty years ago the entrance which is now called the Narrows was wider than it is now, 303.—Does not think it was deeper; it was so much contracted that it was always deep at that entrance, 304.—As it is now, if you were in such a ship as was then in common use you could not turn in and out, so easily as you could have done fifty years ago, on account of the less breadth you have to turn in, 305, 306.—The Insand was in existence then, but did not extend so far down towards the mouth of the harbour as it has done since; but now, since there has been a heavy fleet in the harbour, the end of the sand has gone down; the Insand is not so far down now as it was some months ago; it was down nearly to the Narrows at one time, 307.—Ships force the water, which must escape in some direction, to go in another direction, rather than through the place occupied by themselves, 308.—The water which must escape, instead of going through where their hulls are lying, forces itself underneath, and goes to the opposite bank, 309.—The water would escape more freely if there were no ships lying there, 310.—Can speak confidently of the fact that the Narrows is not so wide as it was, but should be cautious of giving an opinion as to what the exact cause might be, 311.—Half-tide walls are an encroachment on tidal water, 312.—Does not think that half-tide walls would be doing that by halves which full-tide walls would do entirely. Gives reasons, 313.—In fifty years witness can only remember two or three occasions on which ice has come down in any great body, so as to be injurious to the ships, 314, 315.—Does not think that there is a greater formation of ice in a river where there are numerous inlets and wide places in which ice may form, than if the river were contracted to a uniform channel, with a considerable velocity of water alternately ebbing and flowing, 316.—Has very little fear, in removing the Newcastle Bridge, as has been proposed, that the ice formed above the present bridge would tend to injure the ships lying in the river, 317.—If the present bridge were removed, and a bridge with a very large span were substituted, the ice formed above bridge would come down in larger masses, but it generally gets blocked up even before it reaches the bridge, 318.—Believes the whole of the half-tide and full-tide

STRAKER, JOSEPH—*continued.*

walls between Newcastle and the Narrows have been formed by river funds, 319–321.—Thinks all that has tended to contract the river to the proposed width has been done by river funds, 322.—The whole of the cross groins executed by the Commissioners have effected mischief, for the reasons stated; they have the effect of making solid land—that is one reason. Another is, that they impede the ebb and flow of the tide through that land, cause the water to rush out at right angles from those groins, and plough up the bed of the river into holes at the ends of the groins. Thinks the place where it has had the most effect is above Hebburn Quay, 324–326.—Believes that behind every one of those groins land has accumulated, 327.—The one above Mr. Leslie's yard is one of the best examples of that mischief; it caused such an accumulation of mud and silt, immediately below the groin, and within what would be the river line, that he applied to the Commissioners to be allowed to harden the bottom, 328–330.—Cannot point out any other effect than the general effect of stopping the ebb and flow of the water, and collecting mud and sand, and the growing up of land, 331.—Up to the present moment, any positive effect of that groin which could be ascertained, is limited to the accumulation of materials above or below the groin, as the case may be, and within what we may call the river line, 332.—The effect has been that Mr. Leslie has come before the Commissioners, 333.—Is not aware of any other effect. It forms an eddy generally at the end of it; and witness has heard complaints that a boat could not get landed, from the whirl which was on the end, 334.—With reference to Bill Point, considers that by running out the groins to the extreme of the point, it has perpetuated that which should have been removed, and which was recommended by all engineers, 335–339.—Means the throwing out of the wall which runs parallel to the course of the river just above Bill Point, 340.—Thinks this is the only work at Bill Point which has been mischievous, 341.—The commencement of the deposit of ballast at Willington groin was made without any quay or protection whatever. There were a few piles put into the river, out at the extreme point a few planks were carried over them, a ballast engine was placed upon them, and ships lay alongside, and the ballast was taken out and transferred into the river without any protection whatever, 343.—It was beyond Mr. Rennie's line, 344.—It was, perhaps, what was intended as the river line then, 345.—The protection spoken of was in the year 1836, before the present conservancy, 346, 347.—The outer end of it was removed; it was thrown back to Mr. Rennie's line after that; then it continued; they continued to pour ballast into the river till they reached the shore, and after that a strong spring tide came and carried away the whole mass, many thousand tons, and spread it over the river in all directions, 348.—For want of proper quays the ballast has gone in, not in one particular place, but in many places, 349.—One spot, where a good deal has gone in, is just at the foot of Willington gut, there has been material placed there which has been washed down the gut from the river over and over again, and now there is a hard material laid there which probably will remain, 350.—The same has taken place wherever the chalk walls are, 351.—Refers to the chalk ballast as being washed down, and the material behind it is common ballast of all descriptions: sand and gravel, 352–354.—It has happened in various places, 355.—It was the case up at Walker; a good deal washed in there, 356.—Whatever washes out goes down into the river, and you see no more of it, 357.—The practice of depositing ballast is influenced principally by the advantage it is to the parties who have land adjoining the river getting ballast deposited there, as a profit to themselves, and also the improved river frontage which they get, and the valuable land which is made. They never carry ballast to sea, 358, 359.—Speaks positively as to the ballast having washed in, 362.—The harm resulting from it is, the displacing of tidal water and making solid land, and depriving the bar and the lower part of the river of the scour of that tidal water, 363.—Practical result shows that witness's fear is well founded, 364.—Thinks the lower part of the river, immediately above where the ships lie in Shields Harbour, has deteriorated; it has grown up to a considerable extent, 365, 366.—Above the tiers where the ships lie. The effect of the tiers is to keep it clear where they lie; so that it is quite plain the water must have an outlet either under their bottoms or

STRAKER, JOSEPH—*continued.*

alongside of them, and therefore though a ship takes the ground one tide, she is probably afloat the next by the scour, 367.—A sensible effect has already been produced by the abstraction of the tidal waters, 368.—Cannot point to any other case to support his views other than the shoaling which has just taken place just about Shields Harbour, 369, 370. Thinks that if examined, it will be found that there is shoaler water all across the river there, 371.—The works at Willington have not formed part of a system, because they were formed for no purpose but for the profit of the Corporation, 372.—Is of opinion that the works should have been commenced at the mouth of the river, not in the middle, or at the top of it, 373.—Knows that the question whether the waterworks did form part of a system, was the subject of inquiry, 375.—Considers that the conclusion to be drawn was rather left to be inferred by the parties sitting upon the question, 376.—The velocity of the flood tide generally, when flowing through the Narrows, is less than it was fifty years ago, 377.—As far as witness can remember, the ebb tide is not so strong as when he was a boy. Gave an instance of ships driving through the Narrows with two anchors ahead; such a thing has never occurred since, 378.

STRAKER, JOSEPH, ESQ. (*Further Examination.*)—Was at a loss while looking at the chart not to find the Hebburn Shoal, but to find it called by other names. Admits that the shoal has been removed in a great measure, and that the effect of contracting the river has been to remove the sand, yet at that particular part, the groins which Mr. Brooks stated of themselves would be effectual to remove the shoal, were found ineffectual, and the aid of the dredger was obliged to be called in; states that the sand removed by the dredger was effectually removed upon land, but that removed by the groins, has only been moved further down the river; thinks that part of the deepening of the river is due and ought to be attributed to the action of the steamers going up the channel of the river at low water; thinks the works should have been commenced at the mouth of the river, because then the sand removed would have passed out to sea. The part of the shoal removed by the contraction is moved further down the river, 865.—States most confidently, that a great part of the sand, not only from Hebburn Shoal, but all other sand which has been removed from the upper part of the river, has lodged itself from the lower part of Jarrow Quay, up to Willington Quay; that the whole of this space has been very injuriously shoaled, and there have been constant applications for the dredger, not only to clear those berths, but at this very moment the dredger is employed to clear away a part of that sand which is marked red, off some of the works here, 866.—Thinks the works should have commenced lower down, because then the sand would have passed out to sea, 867.—Speaks from passing down the river, and seeing the numerous applications, more than could be supplied, for the dredger to clear away the sand so deposited; the chairman said that if he could not have it, his works must be laid in altogether, 869.—Should not be surprised to find deep water where the dredger had been employed, 870.—Thinks the shoal called Jarrow Sand still exists, 871–873.—Of course, as the number of steamers increased, their operation on the sand must have increased, 874.—Ever since steamers have traversed the river, they have had an effect to a certain extent in deepening it, 875–877.—In the time of the old corporation they employed a dredger to lift up the sand and drop it down again, that it might be taken out of the river, 879.—Was appointed a Commissioner in 1850 on the new Commission, 880.—Is still a Commissioner; from the time of his appointment to the present, only some of the works have been brought before the attention of the Commissioners, 881, 882.—There have been works executed on the river that the Commissioners knew nothing of; for instance, the piling in front of Palmer's Quay, and the raising of the half-tide walls, 883–87.—The works have generally been brought before the attention of the Commissioners, 888.—The great objection to the system is that there is no ascertained river line on which to work, 889.—In many instances there have been no plans; there was a restriction passed some time ago that in future nothing should be undertaken on the river without a regular plan, 890, 891.—Refers particularly to the fact that there is no ascertained river line to which they should go, and on which they can carry the works, 892.—The reason for sup-

STRAKER, JOSEPH—*continued.*

posing that the works have been commenced here and there without reference to the improvement of the river is, that parties had a profitable interest in the matter, such as the corporation, who have a large river frontage, 894.—Mr. Leslie's is an instance, 895.—The late Mr. Crawhall's is another case, 897.—That was at a place opposite his land above the bridge; the embankment consisted of pit props and inch and a half slabs, which gave way, as they were sure to do, and the mass had forced itself into the river, 898.—No works were executed there by the Commissioners, 899.—That is a case of neglect on the part of the Commissioners and their officers, 900.—Those are the cases which witness recollects most distinctly, 901.

SUNDERLAND:

The works have been carried on there under an Act of Parliament, *Philipson*, 3872.—Has been acquainted with Sunderland since 1832; the nothern pier has been extended by witness some distance beyond the pier; the old pier was rooted out and a portion of it to the westward was repaired, *Murray*, 4595, 4596.—Produces plans of Sunderland harbour, which give a curious history of what has been effected there from the time when it had no piers to the present time, and gives particulars of them, *ib.* 4597–4600.

SUNDERLAND DOCK COMPANY:

Is engineer to the, *Murray*, 4577.

SURVEYS:

Within the last 30 years there have been three complete general surveys of the river made; the third is about now finished, *Ure*, 3134.

TAY, RIVER:

The Tay is a striking illustration of what witness referred to on Thursday as the consequence of the flood tide overrunning the entrance from the projection of the headland on the side from which the stream comes, *Rendel*, 4270, 4275.

TAYLOR, THOMAS JOHN, ESQ. (*Analysis of his Evidence.*)—Is mining engineer to the Duke of Northumberland, 2748.—Has paid considerable attention to river improvements, 2749.—Has given evidence on the subject in Committees of the House of Commons and before an Admiralty Inspector, 2750.—Has published a work on river improvements, 2751.—Also published a letter of 5th February 1852, addressed to the Commissioners for the improvement of the Tyne, in answer to some statements of Mr. Calver, 2752.—Has had his attention called to the general condition and character of the basin of the Tyne throughout, 2753.—Made it his business to investigate very particularly, not only the lower part of the basin, but the whole of the basin of the Tyne to the source, about 80 miles from the sea, and to found his views upon a general view of the whole tidal basin, as well with reference to the lower part of the tidal basin as the upper part, 2754.—The average height of the basin of the lower Tyne is nearly 450 feet above the level of the sea, the western portion of the basin is mountainous, and consists of hills rising 1,200 to 1,500 feet above the level of the sea. At the confluence of the Kielder and the Tyne, which is about 70 miles from the mouth of the Tyne, the rise above the level of the sea is 550 feet, making an average of from 7 to 8 feet per mile throughout the extent of the basin. Beyond that the basin rises very rapidly. The tributaries which contribute to the river possess the character of torrents. The rain that falls throughout the extent of the basin has been underrated a good deal. At the eastern extremity it is low; it consists at Tynemouth of about 20 inches and 37 parts, upon the average of several years' observations, exclusive of the very wet year 1852. The western part of the lower Tyne gives 33 inches, and the average of those two is 26·87 inches; but taking the lower Tyne it is 28$\frac{8}{10}$ths. The Kielder and Allenheads constitute the western portion of the basin of the Tyne, which is one of the wettest districts in Great Britain. The western part of the basin of the Tyne is remarkably wet, and the lower portion is remarkably dry; in the western part the average proportion of rainfall is 51 inches. In one part, at Kielder, from the rain-gauge which he kept there, 17 inches of rain fell, which was a very extraordinary quantity. The average of that part of that part of the basin is 51 inches. The average of the whole area of the basin is 39·94 inches, which may be considered 40 inches. Upon the area of the whole basin, which is 1,142 square miles, this amounts to 3,530,000,000 and odd cubic yards, and allowing two thirds to be evaporated, which is very ample, because the principal quantity of rain falls in the tidal basin of the Tyne during the winter months, from October till February, when the evaporation is very trifling, 1,308,859,094 cubic yards pass down the tidal basin in twelve months. Is aware the calculation has been made before, making it about 800,000,000; but that calculation has been made without a due knowledge of the whole rain that falls throughout the extent of the tidal basin; it is in the proportion which he states, 2755.—It comes down the watercourse of the country in eight or ten floods, 2756.—Has not made a calculation of the daily average, because it would be false; for this reason, that the floods make their way down the river very rapidly; there is an average of about 60,000,000 to 80,000,000 cubic yards to each flood, which is about three times the quantity of tidal water in the Tyne during one spring tide, 2757.—Witness's proposition was to enclose the Coble Dean Inlet entirely with full-tide walls, upon the same principle that he would enclose other inlets of the Tyne, such as Jarrow Slake, with a view to propelling the tidal water to the upper part of the basin, 2759.—Between Jarrow Slake and Bill Point made a calculation between the contours of four feet at low water of the previous state of the Tyne, and upon the same soundings of the subsequent state. States the result, 2760, 2761.—Has extended his observations to the tidal volume of the river, 2762.—In following out his views as to the improvement of the river, had occasion to make several calculations both as regards the volume derived from land flood water in the Tyne, and also with regard to the volume derived from tidal water. Proposed to enclose Jarrow Slake, with an amount of tidal water at full spring tides of 2,300,000 cubic yards. Also proposed to enclose other portions of the river below bridge, including Coble Dean and Willington Gut, to the extent of 2,450,000 cubic yards. Above bridge witness's calculations were that 500,000 cubic yards might be enclosed, making a total of 5,250,000 cubic yards, comprising an extent of 217 acres. To replace the tidal water abstracted in that way, provides a basin adequate to make up for any supposed deficiency in the western part of the river, The total length of that basin from the Narrows to Newcastle bridge is 49,896 feet. The mean height of the sand above the bar level, which he proposes to act upon, with a view to create the new tidal basin, is 4$\frac{95}{100}$ths of a foot. Above bridge has calculated upon a mean height of 5 feet above the bar level, giving 3,539,690 cubic yards, with a total of 14,516,142 cubic yards. From this deduct from the Narrows to the east end of Jarrow Slake, 791,267, leaving 13,724,875. To that 13,724,875 adds the deficiency of the tidal water in the western part of the basin, which has been shown by Mr. Brooks upon a section which gives a very good view of the river. It amounts to 3,983,735 cubic yards, making a total of 17,708,610 cubic yards, without allowing for the quantity impounded in the tidal basin, which is also shown upon the section which has been put in by Mr. Brooks, which amounts to 1,802,126 cubic yards, giving a total of 19,510,736 cubic yards; and deducting from that the space not available, being enclosed in the lower portion of the river, converted into solid ground, viz., 2,950,000 cubic yards, it leaves 16,560,736 cubic yards to replace the 5,250,000 cubic yards which he proposed to abstract; that is to say, there is a provision in the upper portions of the tidal basin for about three times the solid capacity that he proposed to abstract in the lower portion of the river, including the operation that he expected to be effected upon the bed, and including the deficiency of tidal water which has been already dwelt upon, and including also the impounded water which cannot make its way out to sea in consequence of the bad state of the section of the river; the capacity of the basin is 16,500,000 to meet 5,250,000. The object is to have the tidal water into the upper portion of the basin. It is a very curious fact that near Stella, which is close to the upper portion of the tidal basin, the effect of the current action is such that the bottom of the river is below the level of the bar, 2763.—It is not a hole, it is a winding of the river at that particular part; it is a reach of the river at that particular point, 2764.—Witness points out where the proposed basin is. The district which witness has in order to replace the

TAYLOR, THOMAS JOHN—*continued.*

tidal water abstracted from the lower portion of the river extends from Jarrow Slake westward, including the whole of the western portion of the river. The particular district which he now alludes to, where the bed of the river at present is below the level of the bar, is this (showing the same). Contends that it is not a pool, it is a winding in the river which is produced by the action of the floods, 2765.—The whole length of that winding, where the river is below the level of the bar, is about three quarters of a mile, 2766.—Proposes the entire portion of the river, from Jarrow Slake westward, to form a basin. Proposes to deepen the upper bed of the river, and to substitute that, 2767.—In order to render the bed of the river a proper receptacle for the tidal water, considers that the sands which encumber the actual bed should be removed, 2768.—The amount of silt encumbering the bed in the upper and lower portions of the river is 13,724,000 cubic yards, in addition to which witness calculates upon the deficiency of tidal water, which has been shown upon Mr. Brooks' section, and also upon the tidal water which is impounded in replacement of the supposed deficiency that may be abstracted from the lower portion of the river by the erection of tidal walls. Witness's calculation is to abstract 5,250,000 cubic yards of water at the lower part of the river, and to replace it in the upper portion of the basin, the capacities of which are such that 16,500,000 cubic yards are available for that purpose instead of the 5,250,000 abstracted, so that he has three times the amount in the upper portion of the tidal basin from Jarrow Slake westward, of available space, as compared with that proposed to be abstracted from the river, 2769.—Means available space for the reception of tidal water, 2770.—By clearing out the receptacle, and by supplying the present deficiency of tidal section, and by getting out the impounded water from the river, prepares a receptacle for any supposed abstraction from the lower part of the basin, three times as large as the amount of that abstraction, 2771.—The tidal volume would be increased if witness's improvements were carried out, 2772.—The plan which witness has given is his own distinct plan, 2773, 2774.—Witness proposes to exclude 217 acres of the tidal basin in the lower portion of it; Mr. Brooks will be able to say what he proposes to exclude, 2776.—Believes his plan does not differ from Mr. Brooks' very materially. Is proposing the same general principle which Mr. Brooks has been explaining before of improving the whole channel of the river, which would increase the tidal wave, 2777.—Believes Mr. Brooks' plan resembles his (witness's) very closely, 2779.—Has no doubt these calculations would approximately apply to both, 2780.—Does not mean to make any particular place a tidal basin, but to substitute the whole extent of the river from Jarrow Slake westward, 2781.—Should say there would be an alteration of about two feet between the proposed low-water level and the present low-water level, 2782.—The improvement with respect to the admission of more tidal water will only refer to that part which is above low-water level. That is assuming that the high-water level is only the same as it is now. If it be higher than it is now, of course that argument would not apply, 2783.—Mr. Brooks proposes to enclose 201 acres, and witness 217, 2784.—The proposed enclosure has reference to depth also, because the enclosure takes place in that part of the tidal basin which does not represent so great a depth as the middle. The average depth which witness proposes to enclose is about 7 feet. Mr. Brooks says that his depth is about the same. Is speaking of high water. Witness states not only the acreage, but the mean depth of the water which he proposes to enclose in the 217 acres. It is 7 feet, 2785, 2786.—Is of opinion that half-tide walls cannot be effectually carried out. Thinks the notion of half-tide walls in the lower part of the estuary of the Tyne is inconsistent. Explains what he means by making a sketch, 2787.—Thinks if the principle is to be carried out, it had better be carried out completely, and not half done. Has come to the conclusion that only full-tide walls are adequate to answer the purpose, 2788.—In point of fact the principle has not been carried out anywhere yet, 2789.—Thinks the freshes under proper control ought to be the governing power in the river, 2791.—Has quoted freshes, which he has had an opportunity of making observations upon, and found that one of them discharged 80,000,000 ton in 24 hours. Has also had an opportunity of referring to an observation made by Mr. Calver at Newcastle. That fresh was 14 feet at Newcastle Quay, and the rate per hour was

TAYLOR, THOMAS JOHN—*continued.*

24,600 feet, between four and five miles an hour past Newcastle Quay, where the ordinary ebb is not much more than half that velocity, so that the effect is four times that of an ordinary tide, the velocity being double and the effect being as the square of the velocity, 2792.—The low lands of the Tyne are flooded in the very highest freshes of the river, 2793.—Thinks the velocity would be increased very materially, and the whole of the river very much improved by the removal of Tyne bridge. The resistance of the cross section of Tyne bridge is about four or five times the velocity of an ordinary cross section, 2794.—Thinks that the Tyne Improvement Commission has worked efficiently. Thinks that the works which they have projected are very beneficial to the banks of the Tyne, and to the Tyne itself; they have got an Act of Parliament for piers at the mouth of the river, and also for improved moorings in the river, also for the Hay Hole Dock, with regard to which witness observes that perhaps nobody, except one constituted as the Tyne Commissioners are, could have established a dock in the way in which it is established, for they are bound by their Act of Parliament to reduce the dues in the dock commensurately with the reduction of the debt, so that ultimately the expense to be paid by shipping frequenting the dock and coals shipped at that dock will be reduced to the expense of superintendence and the expense of repairs of the dock itself, 2795.—Thinks very highly of the Hay Hole Dock, 2796.—The whole of the staiths are the property of the Duke of Northumberland, 2797, 2798.—The expense of constructing the shipping places at Hay Hole was 9*l.* a foot; therefore, if the number of feet required to be projected to Mr. Rennie's line was stated, you can get the amount. Thinks he was once asked the question before, and came to the conclusion that it was 50,000*l.* or 60,000*l.*, 2799, 2800.—That does not include the cost for affording railway approaches, 2801.—That would make a material addition to the cost, 2802.—The Hay Hole Dock, or the Northumberland Dock, will give you deep water at all these staiths, 2803.—Witness is the Mineral Agent of the Duke of Northumberland, 2805.—Has never had any river engineering works under his control excepting shipping places, 2806.—Witness's first results are given from Mr. Rennie's data, and the others subsequently, 2807.—Witness calculated those results from Mr. Rennie's data, and those contour lines himself, 2808, 2809.—Mr. Brooks told witness that he proposed to enclose 201 acres, 2810, 2811.—Those 217 acres are in addition to the abstraction of Jarrow Slake and the Northumberland or Hay Hole Dock, 2812.—Palmer's encroachment and the encroachments of the Corporation from Jarrow to Hebburn Quay are in addition to Jarrow Slake, 2813.—Witness's calculation of the enclosure of Jarrow Slake was 360 acres, with a mean depth of 4½ feet at high spring tides; at dead neaps nothing, 2814.—Was examined upon the Jarrow Slake Bill, 2815.—Advocated that on the same principle that he has now advocated the shutting up of Coble Dean, that it was an inlet that interfered with the direct course of the current, 2816.—With respect to the range up at Stella, assumes the same lift of tide as now at springs, and at dead neaps 18 inches. Assumes to lower the bed; does not profess to say that the high-water level of the river will be increased at all materially; it may be increased a little, but what witness relies upon is the acquisition of tidal water by the lowering of the bed in that district of the river, 2817.—The bed at Stella is lower than the bar, 2819.—There is a considerable winding of the river, 2820.—Hopes Mr. Brooks will not pursue the same policy as he has done in the Tees, 2821.—If the double bend at Stella were cut off and a straight cut were brought through that same space, the depth of water could not be retained without making full-tide walls above the reach of the tidal or other current, 2822.—Generally speaking, cutting off points in a river does good, 2823.—Thinks cutting off White Hill Point to the extent of 200 feet within Mr. Rennie's line would do good to the river; at the same time it would injure the water at South Shields very materially, 2824.—Agrees with Mr. Brooks in thinking, that supposing White Hill Point were cut off 200 feet there must be something like docks, as proposed at South Shields, to preserve the line of the current, otherwise you have a shoal extending perhaps 200 to 300 feet at a point where there is at present deep water at South Shields, 2825.—The point up to the Tyne above bridge, which witness considers the limit of the tidal range, is about a mile above Byton, 2826.—Witness has himself observed the quantity of water

TAYLOR, THOMAS JOHN—*continued.*

produced by the rainfall, which comes down through Tyne bridge, 2827.—Has tried the velocity and observed the depth; has made a calculation of the quantity of water discharged; had a special object in view, contrasting the greatest amount of discharge from the Tyne with the least amount of discharge from the Tyne, 2828.—Actually measured the quantity of water discharged at Newburn Quay, 2829, 2830.—Compared that with the quantity going through the bridge at Newcastle in the same flood. The velocities were observed by witness, and the depths also, and he made as close a calculation as he possibly could, his object being at the time to contrast the highest discharge of the flood waters with the lowest summer discharge of the Tyne, 2831.—The book of 1851 is dedicated to his Grace the Duke of Northumberland, 2832.—Has explained why, in treating of the river Tyne in that book, he has left White Hill Point untouched, 2833.—That cut to which witness has referred was Mr. Rendel's plan, 2834.—The proposed alterations, supposing them carried out, would affect a part of the bed of the river, which is now as low, or nearly as low, as the bar. Pointed that out upon the section of the river as a proof of the capabilities of the river; and that if the intermediate shoals were removed from that point down to Tyne bar there really is no reason why there should not be a very good depth of water throughout the whole of the intermediate space, 2835.—Proposes the carrying out of a certain system of river lines upon the general principle, which he has already explained, 2836.—The compensation which witness has proposed for the shutting out of tidal water from Jarrow Slake consists of the several improvements which he has mentioned before. First, the reduction of the low-water surface, by removing the silt upon the present bed of the river, by means of works constructed for that purpose, 2837.—Witness's object is to have the silt removed by the construction of proper works upon the river, and so to make a new tidal basin in substitution of that which is supposed to be abstracted, 2838.—Would be quite satisfied with having the whole of the bed of the river reduced down to the level of the bar; but it is in contemplation, by means of piers, to reduce even the level of the bar perhaps 5 or 6 feet, and then there may be a possibility of reducing also the entire upper portion of the river, at all events to the level of the present bar, 2839.—The body of water will not fall below the low-water level, 2840.—The spaces which have been cleared in the bed of the river below low-water level are operated upon by the currents of the river, otherwise they would be filled up; but irrespectively of that witness is satisfied with the depth in that portion of the river which is now below or at the level of the bar; what he wants is to remove, by the construction of proper works, the intermediate mass of silt which lies between that portion of the tidal basin and the bar, 2841.—The excavations referred to below the low-water level are always filled with water up to low-water level, 2843.—Does not calculate upon any additional section of that particular portion of the river, but speaks as to the portion intervening between there and the lower parts of the tidal basin. Can point another portion of the river which perhaps is not more than 2 or 3 miles from that, where there is no such section; here the sand in the river lies perhaps 10 or 12 feet above the bar level; wants that shoal removed, and, generally, should be satisfied if the intervening shoals were removed, 2844.—Would be satisfied if by these improvements the level of the river were got generally above Newcastle, and from there to Leamington, down to the level of the present bar; and with a view to the future bar, the bed would then be at a considerable elevation above that bar, 2845.—Thinks a further reduction of the bed might be made, 2846.—Has no doubt of being able to get the bed from Newcastle bridge to Leamington, down throughout to the level of the present bar, with the construction of proper works and the deepening of the outfall which will be occasioned by the construction of the piers, 2847.—Has made a calculation of the amount of fresh water that falls, comparing it with the amount of tidal water which now flows in, 2848.—Thinks he stated the amount of fresh water at 1,309,000,000 cubic yards in the year; that is discharged in 6, 7, or 8 floods, 2849.—The average would be about 3,600,000 yards a day, 2850.—The total average of the tidal water is in spring tides about 26 or 27 millions cubic yards, 2851.—Thinks Mr. Rendel does not make it more. Witness is going upon Mr. Rennie's calculation; it is not a correct calculation, because he did not allow

TAYLOR, THOMAS JOHN—*continued.*

for the deficiency of tidal water in the upper part of the basin, 2853.—The tidal amount is about 26,000,000 cubic yards each tide, 2854, 2855.—That is 52,000,000 a day in spring tides, in neap tides of course very much less, 2856.—Rather less than 40,000,000 on the average, 2857.—Therefore three fourths would be the mean; the upper part of the river in dead neaps; does not carry more than about 18 inches; in spring tides it flows about 7 feet, 2858.—Instead of 40 say 38 millions, and the land water will be about 3,600,000, 2859.—Therefore it is between one tenth and one eleventh, calculating it in that way; but if you consider that the quantity of flood water is discharged in 8 or 10 floods in the year, it makes a great difference, and involves the whole question, 2860.—The moving tidal column acts with greater power in passing through a channel with a greater depth at low water than through a channel with little water at low water, 2861.—The same quantity of tidal water in a deeper section has greater power than in a shoaler section, 2862.—It will go faster, 2863.

TEES:

The works there began at Stockton, *Brooks*, 2444.

TEES NAVIGATION COMPANY:

A report was made upon the subject, *Brooks*, 2436.

TIDAL AREA:

Moved for a return of the encroachments which had been made; particulars of, *Straker*, 510.

TIDAL BASIN:

Witness describes the tidal basin he would provide to replace the tidal waters he would abstract by his other plans, *Taylor*, 2763.—Witness does not mean to make any particular place a tidal basin, but to substitute the whole of the river from Jarrow Slake westward, *ib.* 2781.

TIDAL GAUGES:

Are watched every five minutes, *Brooks*, 2575.

TIDAL OBSERVATIONS:

Brooks, 2409.—Shows that the water ebbs out to a lower level now than formerly, *ib.* 2441.

TIDAL WATER:

Thinks anything which diminishes the tidal water is of serious consequence; the quantity of tidal water entering or going out has been diminished, *Straker*, 75, 76.—A good effect has been produced by the abstraction of tidal water in the Tyne, *ib.* 368.—The quantity of tidal water entering the Tyne in Mr. Rennie's time, and according to observations in 1849, shows a loss upon a spring tide of 34,261,000 cubic feet, *Calver*, 1587.—Unaided by tidal water, the channel seaward of the Narrows would be a winding course, perhaps not deeper than half tide, running along the southern shore; a great quantity of tidal water is wanted for the entrance, *Rendel*, 2279.—The amount flowing up the river is considerably diminished by the resistance at Bell Point, *Brooks*, 2587.—The average of tidal water in spring tides is 26 or 27 million cubic yards, *Taylor*, 2851.—The quantity passing over the bar in the course of the year is about 29,200,000,000 cubic yards, *Rendel*, 4280.—The receptacle ought to be between Newcastle and Shields, *ib.* 4355.—The proportion of tidal water over the bar to the land water is as 17 to 29, *ib.* 4394.

TIDES:

Has never been able to get Mr. Comrie's tidal observations of 1849, which the Commissioners paid for, *Stevenson*, 1252–1258.—Two sets of spring tides were taken this last year, one good tidal observation in a pure state—that is to say, when there is no disturbing course from fresh water in the river—is worth a hundred as regards the tidal column, when it is mixed with fresh water, *Brooks*, 2572.—Supposing Giles' survey of 1813, and Comrie's survey of 1849 to be correct, there has been in that interval a less flow at Newcastle as compared with Low Lights, to the extent of 5 inches, *Rendel*, 4352.—Particulars of, *Stephenson*, 4253–4259.—Particulars of, *ib.* 4261–4269.—Particulars of the, *Murray*, 4613–4624.—If a dam were put across to prevent any water going into the Tyne there would be no

TIDES—*continued.*

tidal current going in. The current inwards is the effect of the void. Witness transfers the inlet to the pier heads, and collects it there, *Walker*, 4505.

TIDE GAUGE:

There is a good one at the Low Lighthouse, *Wake*, 2958.—Can tell exactly the depth of water on the bar by that instrument, *ib.* 2966.—It is under the charge of the keeper of the lighthouse, *ib.* 2975.—There is only one self-acting tide gauge fixed in the river, that is at the Low Lighthouse, *Brooks*, 2564.—In 1849 there was a very elaborate series of tide observations, *Comrie*, 1920.

TITLE TO THE SOIL:

Explains the circumstances of the question of title as it affects the soil of the Tyne and the Corporotion, *Clayton*, 3299.

TONNAGE:

Is aware that by the old tonnage ships might be built as deep as was liked, and it had no effect upon their tonnage, *Dunn*, 3273.

TRAINING WALLS:

Mr. Brooks, when he joined the Commission, had no intention of training walls whatever; Mr. Rennie had, *Purdo*, 576.—They would no doubt make an even bed, *Poppelwell*, 719.—To have a river in the most perfect state there should be a uniform training wall with no openings, *Ure*, 3107.

TRANSMISSION of VESSELS: from Shields is another great object in the Tyne, *Calver*, 1853.

TRANSVERSE JETTIES:

Retard the stream, *Poppelwell*, 716.—They have all the objections of half-tide walls, and a great many more besides, natural to themselves, *Robinson*, 3841.—

TRANSVERSE SECTIONS:

Are more important than longitudinal sections, because in a transverse section you get the contents of the tidal receiver, *Calver*, 1781.—Witness is of opinion that transverse sections should be taken directly across the channel, *Brooks*, 2214.—They are of no use for testing the capacity of a river, unless they are very close together; for instance, Mr. Rennie's chart does not show the Tyne Main Shoal, nor the Howden Shoals, though they both existed, *ib.* 2215.

TRINITY HOUSE:

Ten of the younger Brothers of the Trinity House sit at the Board with the twelve elder Brethren, and manage all business, *Wake*, 3899.—Is still a member, but in consequence of a byelaw made at the Trinity House witness was prohibited from holding his seat at the Board, as he took a situation under the Corporation of Newcastle, *ib.* 3902.

TURN BOOKS:

Kept at Newcastle Quay, that no undue advantage might be taken of the ships' turns, *Danson*, 1489.

TYNE:

Nothing could be worse than the management of the Tyne, *Straker*, 298.—It is a mixture of a powerful river and a limited estuary, *Purdo*, 638.—The river is better than it has been for some time, *Danson*, 1527.—Plan of the river, by Fryer, one of the oldest records of the state of the Tyne, *Brooks*, 2240.—Description of the tidal basin of the Tyne, *Taylor*, 2748.—There is an average of about from 60,000,000 to 80,000,000 cubic yards in each flood, which is about about three times the quantity of tidal water, during one spring tide, *ib.* 2757.—The limit of the tidal rauge above bridge in the Tyne is about a mile above Ryton, *ib.* 2826.—It has much improved as a sailing channel, both with regard to depth and straightness, *Ure*, 2878.—There is a great resemblance between the Tyne and the Clyde, except that the Clyde is not a bar river, *ib.* 2895, 2896.—The sailing channel of the river is deeper and wider than formerly, *ib.* 2908.—The Tyne and Clyde are much the same with regard to the tidal and land waters, *ib.* 2921.—The rise of tide at the mouth is about 14 or 15 feet, *ib.* 2925.—For navigable purposes it is very considerably improved, *Brown*, 3142.—Calculations of the low-water contours at low water per Rennie in 1813, and per Calver in 1849, show an increase of 112 feet, *Taylor*, 2760.—Mr. Rendel was employed by the late conservators to report upon the improvement of the Tyne, *Clayton*, 3307.—When anybody has been detected putting anything into the river he has been brought before the magistrates, *Cowen*, 3676.—In many places on the river opposite to the restriction in the foreshore there are chalk walls as guiding walls, half-tide walls, *ib.* 3683.—The greatest benefit that could be conferred upon the Tyne would be to leave the Commission alone. If not interfered with, the Commission will work well, and accomplish all that can fairly be expected from it, *ib.* 3701.—Considers its condition improved; the channel is straighter, shorter, and deeper, *Robinson*, 3812.—The sailing channel is of very great importance, *Rendel*, 4008.—It is a compound case; it has an estuary dependent on tidal water, and an upper river dependent upon land water, *ib.* 4011.—Mr. Comrie's currents, taken in 1813, show that the water flows out of the Tyne at the same time that the water is running from north to south across the mouth, *ib.* 4084.—It is three years since witness saw the Tyne, *ib.* 4277.—Did not think that the jetties, embankments, and other works executed and proposed had injured the works up to that time, *ib.* 4278.—In the upper part of the river, for reasons witness has already named, it would be a pity not to take advantage of carrying full-tide walls, but that lower down, where the tide is the great agent upon the harbour and the bar, it is wrong to abstract the tidal water, *Walker*, 4448.—Considers that the Tyne is improved as a navigable river since 1832, *Murray*, 4578–4588.—Produces reduced charts of the Tyne of 1813, 1849, and 1854, *Brooks*, 4770.—Thinks there is less sand in the Tyne now than formerly, *Murray*, 4745.

TYNE ACT OF 1850:

Remarks upon Hay Hale Dock, *Straker*, 285.

TYNE BRIDGE:

The velocity would be much increased, and the whole river much improved by its removal, *Taylor*, 2794.—Does not despair of having docks of considerable magnitude much higher up the river. It is possible to do away with Tyne Bridge, or make a new one so as to pass ships through it, *Cowen*, 3599.

TYNE COMMISSION:

Thinks it has been a complete failure, *Linskill*, 948, 949.

TYNE CONSERVANCY BILL:

If the propositions there proposed had been adopted things would have worked much better, *Lamb*, 389.

TYNE IMPROVEMENT:

Took the opinions of Mr. Rennie and Mr. Rendel as being the specific engineers who had been called in, *Purdo*, 569.—Mr. Rennie and Mr. Rendel agree in their views of improving the river, as far as the river line itself goes, but not as regards the bar, *ib.* 571.—The substantial improvement in the Tyne is due to the dredger and not to the jetties, *Poppelwell*, 817, 818.—Thinks the river should be treated as a whole; the works should be commenced at the mouth, *Straker*, 864.—Improvement Commission has worked efficiently. The works projected by it are beneficial to the Tyne, *Taylor*, 2795.—Act passed on the 15th July, 1850, constituting the present commission, *Clayton*, 3301.—Thinks every arrangement of works which are made at the mouth of the Tyne which does not go directly to the earlier propagation of the wave up the river, and to its acceleration when so propagated, thereby increasing its momentum, and consequently its volume at Newcastle, is bad, and that if any arrangement of that sort be permitted, a larger amount of tidal water must be allowed to pass through the entrance, if not, the worst consequences may be expected, *Rendel*, 3943.—The navigable channel up to Newcastle should be obtained with the least sacrifice of tidal water, especially pending the result of any intended works at the entrance, *ib.* 3996.—There should be some compulsory power over the individuals interested in the Tyne, *ib.* 3997.—Commissioners. Witness has never been consulted by them, *Walker*, 4456.

Tyne Main Shoal:

The principal improvement between Dent's Hole and Newcastle Quay was the dredging of Tyne Main Shoal, *Straker*, 97.—Was removed by the dredger, *ib.* 235.—Was at St. Peter's, but is partly gone, *Danson*, 1521.—Had been removed by the former conservators before witness commenced his duties, *Brooks*, 1983. —Remembers Tyne Main Shoal. When first a pilot there was 2½ feet depth. There is now 6½ or 7 feet, *Story*, 3170–3172.—Formerly vessels drawing less than 10 feet water (going from Newcastle to Shields) would stick on Tyne Main Shoal, *Dunn*, 3235.—Remembers it being very much complained of; up to the year 1833 and 1834 the corporation had attempted no dredging in the bed of the Tyne, *Clayton*, 3290.

Tynemouth:

The headland is to the north. If it were removed, and there were projecting land on the southern side of the harbour, the tide would be heaped up in the Tyne more than at present, *Murray*, 4709–4712.—In the borough of Tynemouth there is a very great hatred to the corporation of Newcastle, *Cowen*, 3716.

Tynemouth Docks:

Was examined on the Tynemouth Docks in 1853, *Rendel*, 3948.—Was of opinion that those docks were part of a system in connexion with two guiding piers, which would be essential for removing the sand from the bar, *ib.* 3951.—Witness's opinion on the scheme which was opposed by the Commissioners in 1853, *ib.* 3974, 3975.—The Dock was opposed by the Commissioners before the Admiralty surveyor, Mr. Hawkshaw, and in Parliament, *Macartney*, 4414.

Tynemouth Headland:

The more it is extended, the further out it will bring the Herd Sand, *Rendel*, 4291.—It is like a groin which has the effect of collecting sand on the opposite side to that from which the stream comes that brings the sand, *ib.* 4292.

Tyne Navigation Bill:

Extracts from and questions in reference to, *Calver*, 1663.

Ure, Mr. John Francis. (*Analysis of his Evidence.*)—Is resident engineer of the River Clyde; was for four or five years one of Mr. Rendel's principal assistants, 2864, 2865.—Visited the Tyne for Mr. Rendel in 1849, for purposes connected with the Tyne Navigation Inquiry; the survey was made by Mr. Rendel himself, 2867.—Came down at the request of the Tyne Commissioners and Mr. Lindsay, M.P., about a week ago; has examined the condition of the river and taken soundings upon it; has been twice, once alone, and once with the Commissioners, 2868–2871.—Has read the evidence that was given on the Jarrow Dock Bill; thinks that the only two points of deterioration in the navigation which were alleged in that evidence were one at Jarrow, and another case of the section at the bar; examined the shoal at Jarrow, and found it to have about 18 feet 9 inches at high water; it has 5 feet or 5 feet 3 inches at low water, rather less than is shown on Mr. Comrie's survey; afterwards went into the calculation of the section of the bar; states to the Commissioners the surveys from which he calculated the state of the bar; taking the two surveys of 1813 and 1854, thinks there can be no question that the bar has materially improved, 2872.—As he went down the river witness took soundings of the places where shoals were said previously to have existed, and the least depth upon any of these places was 17 feet 3 inches, 2873.—Recollects Tyne Main, Hebburn, Jarrow, and Ellison Main, and thinks that comparing them with previous surveys, the navigation has improved as a sailing channel, both in regard to depth and straightness, 2874–2878.—Considers the deepening of the bar a matter of the greatest importance, 2879.—Would commence at the top of the river and carry the works down it, because the jetties, which are run out, and other works formed in the upper part of the navigation set the sand in motion, and it goes further down; and upon coming to execute the works lower down, it has a tendency still further to force the sand down; whereas, by starting with the works at the lower part, no doubt the sand is set in motion above, but thinks there would be more difficulty in removing it, 2880.—The further the tidal wave is sent up the river, the

Ure, Mr. John Francis—*continued.*

greater the beneficial effect upon the lower portion, 2881.—Would lead the currents of flood and ebb in the same channel, 2882.—Is in favour of full-tide walls, 2883.—The course pursued in the Clyde was, first by making full-tide jetties in about the year 1770. The depth at Glasgow previously, at high water, of neap tides, was about a foot or 15 inches, and at spring tide about 3 feet or 3 feet 6. Mr. Golborne advised the construction of these jetties, and in the course of ten years they lowered the bed of the river, so that as much as 7 feet water were got at Glasgow. Mr. Golborne was asked how to get more water; and he advised lengthening the jetties still further, and increasing their height so as to direct the current of flood better through them. About 1800, Mr. Rennie advised the joining of the ends of these jetties by training walls, and that was found to produce considerable benefit; and after Mr. Rennie's death the trustees, wanting a still deeper river, they completed these half-tide to full-tide walls, and it had that effect. The present depth of the river at Glasgow is about 16 to 18 feet more than it used to be. The column of tide at Glasgow is now about 6 feet 6 or 7 feet at neap tides, where formerly there were no neap tides at all, and now the spring tide is about 8 feet 6 inches, where it used to be 18 inches; it is so stated in Mr. Smeaton's report of 1755, 2884.—Should think the interests of Newcastle and Shields equally important as regards the bar, because with a deep river up to Newcastle, of course, as large vessels would get up to Newcastle as to Shields, and as those vessels would most likely require to leave about high water, they could not get over the bar till perhaps the tide had gone down an hour or two hours, and the same in arriving; so that, on the whole, the interest of Newcastle would be quite as strong in maintaining the bar as the interest of Shields, 2885. —If it is 21 feet up to Newcastle, then it must be more than 21 feet on the bar; because, supposing a vessel draws 20 or 19 feet, and she leaves Newcastle upon the top of the tide, the tide has gone two hours before the vessel gets to the bar, which must be taken into calculation. That perhaps would make 4 feet of height of tide, 2887.—Mr. Walker is the consulting engineer of the Clyde. Witness consults Mr. Walker. Mr. Cowen, the chairman, first applied to witness to attend about a fortnight or three weeks ago. Witness came on Friday, 2888–2892.—The principal information witness has given has been from the plans; has included the Spar Hawk Channel where it was shown upon the section, 2893, 2894.—There is a considerable resemblance between the Clyde and Tyne, but the Clyde is not a bar river, 2895, 2896.—No doubt the great object has been to make deep water up to Glasgow, 2897.—The width of the Clyde, when Mr. Goulburn began to operate upon it, was reported at several different widths, 600 and 800 feet, and it was reduced by these jetties to about 150 to 200 feet, 2898.—It was found sufficient for vessels trading to it at the time, but now with the vessels which come, the largest upwards of 2,000 tons, it is found much too narrow, 2899.—The money expended upon the Clyde, taking everything into account, is somewhat under two and a quarter millions; but that is over a period of 80 or 90 years, 2900.—The benefit that resulted from joining by walls the ends of these jetties was the making a truer current, and getting deeper water. These jetties make eddies, which joining them with walls removes. Mr. Rennie's report states that there was one foot more water at the ends of the jetties than between them, and, of course, one of the objects of the training walls was to gain that additional foot of water, 2901, 2902.—In causing the channel of a river containing sand to be operated upon by the current, the line of wall should be as little broken as possible, 2903.—With the assistance of a surveyor in Newcastle, calculated the sectional areas in Shields Harbour. The point of view witness looked at it from, was the quantity of material which had been removed out of the channel of the river, 2904–2906.—Between the present river walls it is narrower than it was, but the plan shows the sailing channel to be wider and deeper, 2907, 2908.—Witness takes the plans as they are given in evidence before the Commissioners, 2909. —So far as the sectional areas of the sailing channel are concerned, witness's information is founded upon Mr. Comrie's repetition of his survey of 1849; but with reference to his statement of two and a half millions of yards of land taken out of the present channel of the river, that is a calculation partly by witness himself, and partly with the assistance of a

URE, MR. JOHN FRANCIS—*continued.*

Newcastle surveyor, from Mr. Rennie's survey of 1813 and Mr. Comrie's of 1854, 2910.—Mr. Rennie quotes the Clyde as an example in favour of some of the improvements he recommends; believes Mr. Calver does the same, 2912, 2913.—With regard to landowners at the time of these improvements, all the land that was acquired from the river at that time was taken possession of by the land owners opposite, in consideration of making these improvements, 2914, 2915.—The Clyde trustees have had to buy back a considerable portion of the land, 2916.—Thinks the cheapest dredging and depositing upon the Clyde would not be under a shilling a yard, measuring the embankment, 2917.—Thinks a ton would be about one third less than a yard, 2918.—The Clyde is a river below Glasgow. The estuary commences about Dunbarton, on Port Glasgow, 2919.—The Clyde, as a river made navigable, differs very much from a simple estuary, 2920.—The Clyde and the Tyne are pretty much in the same condition with regard to the land waters and the tidal waters. At Newcastle there is a rise of tide of about 9 feet, and in the Clyde about 7½ feet, 2921.—Should not think the Clyde more dependent upon the water brought down from the interior than the Tyne, 2922.—The floods which come down there are more prejudicial, perhaps, than otherwise, from the immense amount of sand which deposits in Glasgow harbour; they have to dredge there about 100,000 cubic yards a year for a maintenance, 2923.—The rise of tide at the mouth of the Clyde in ordinary spring tides is about 9 or 10 feet; neap tides about 8 feet, being a difference of two feet, and at Glasgow it is 2 feet. At the mouth of the Tyne the rise of tide in 14 or 15 feet, 2924–2927.—Mr. Comrie's soundings of 1854 give one foot three inches more than Mr. Rennie's soundings of 1813 over the whole breadth of the bar, 2928, 2929.—Does not know the comparative quantity of fresh water which comes down in the Clyde and the Tyne. Puts in the plan in Messrs. Palmer's case, 2930.

URE, MR. JOHN FRANCIS. (*Further Examination.*)—Some of the most important of the manufacturing establishments of Glasgow are built on ground reclaimed from the river, 3075.—Up to 1854 the total expenditure of the Clyde Trustees was about 2,250,000*l.*, 3076.—The bonded debt is about 800,000*l.*, 3077.—About 510,000*l.* has been paid for land, 3078.—For harbour works about 480,000*l.*, for river works, including dredging plant, 330,000*l.*, making total expenditure on works about 810,000*l.*, 3079.—Where the parallel dykes are well formed, and there is no interruption to them, dredging is not required to maintain the river. The river has a tendency to deepen itself, except where there are hard bars across it, such as gravel beds or hard clay; within the last fifteen years, where these dykes have been well formed, it has deepened itself nearly three feet. The whole dredging required in the Clyde is to maintain the harbour. It may be called a mountain torrent, and the water in passing through the harbour gets still. The velocity in times of floods does not exceed two miles an hour, and in consequence the large deposit, about 100,000 cubic yards a year. That requires to be removed for maintenance in the harbour, and nothing more where the dykes are well formed. The trade of the river is one of the principal sources for increasing its depth, especially with the steam boats at low water; as there is a seven hours' ebb and a five hours' flood, the tendency is always to throw the raised material further and further down till it gets where it passes over the dykes and deposits in the ground between them and the foreshore, 3080. The heavy floods go partially over the low lands. Formerly the heavy floods rose on the quays six or eight feet, and were a week getting away; now the heaviest never covers the quays, and gets away in a day, 3081, 3082.—The exact quantity of sand removed out of the Tyne since 1813 is 2,698,000 yards. That is, from Newcastle Bridge to St. Anthony's Quay, 260,000 cubic yards; from St. Anthony's to Hebburn Quay, 290,000; from Hebburn Quay to Howdon Dry Dock, 810,000; from Howdon Dry Dock to the west end of Jarrow Slake, 98,000; from the east to the west end of Jarrow Slake, 290,000; and through Shields harbour, that is from Jarrow Slake to the Narrows, 950,000 cubic yards, 3083.—These quantities are obtained from the plans of 1813 and 1854, as laid out by Mr. Comrie, and calculated by Mr. Bell, a surveyor of Newcastle, and witness, 3084, 3085.—The business of the Clyde is managed by committees, 3086.—Everything that is to be done is first brought before the committee, and at the monthly

URE, MR. JOHN FRANCIS—*continued.*

meetings of the Trustees, the reports of the Committee are read in full, and the minutes of the meetings, 3087, 3088.—The constitution for the government of the Clyde is elected from the Town Council, the Chamber of Commerce, and from the Trades' House; the magistrates of Glasgow are all Trustees ex-officio. First each ward elects three to the Council, and those return one to the Trust. It is a representative body, 3089, 3090.—It consists of 32 or 33, 3091.—The quantities given, as obtained from the bed of the river, are calculated from what appears on Mr. Rennies' plan and Mr. Comries' survey, 3092.—From Mr. Rendel's plan of 1849 with Mr. Comrie's recent soundings of 1854, 3093.—The calculations are a comparison of Rennie 1813 with Comrie 1854, 3094.—The dredger in going over the ground takes off the ridges, and the current levels those ridges, 3096.—If the Tyne main shoal or any other part of the river is hard, and you dredge through the hard part, and it is soft below, the current of the river might remove the soft part, 3097.—A little dredging would not equalize the bed of the river, it would require a great deal to do it properly, 3098.—The dredging on the river Clyde is one of the principal sources for increasing its depth, 3099.—The steamers are powerful agents in disturbing the sand and soft materials, and going constantly up and down act as partial dredging, and the current removes the matter so disturbed, 3100, 3101.—Where the parallel walls are properly formed it has deepened the bed of the Clyde three feet in 15 or 16 years, 3102.—There are some places where they have not got proper training walls; where there has been no increase in the low water capacity of the channel above what has been made by the dredging machines, 3103.—It is essential to have a uniform training wall, because if you have any back water, its tendency in flowing into the main channel of the river is to cause a cross-current, and to make a deposit below, and these are almost the only circumstances under which shoals are formed in the Clyde. The current is so strong they do not form to any great extent, 3105.—An opening in a wall has a tendency to produce a shoal, 3106.—To have a river in the most perfect state there should be a uniform training wall with no openings, 3107.—The mooring of vessels, and the number of them moored, is also a powerful agent in deepening the channel where there is a velocity, 3108.—In Shields harbour should think the increase of the number of vessels would lead to a deepening of the harbour in the neighbourhood of the vessels, 3109.—With regard to the floods, there has been no diminution in the magnitude of them, 3110.—A good many rivers have been improved, but not all; on the Tyne there has been a good deal done, 3111, 3112.—Cannot say it has been very much improved; there has not been time to do much, 3113.—Has not made any dates of improvement, but has formed his opinion from the discussions in this room, 3114, 3115.—Drainage brings the water more quickly into the channel of the river, into the main drain of the country, 3116.—Should say that the floods in the Tyne are of as great magnitude now as they were 50 years ago. There might have been an extraordinary flood 50 years ago, and there may be one 50 years hence; but, as a rule, should say that the quantity of water that passes down the Tyne in a given time during floods must be greater than it was 50 years ago, 3117.—There is more land water passing down the Tyne now in a given time in the height of a flood, 3118.—During times of continuous rain, which is the principal time when flood water falls, does not think there is much evaporation, 3120.—The old system of drainage was bad; the water was retained for a long time, and when a great frost and extraordinary thaw came, then were those extraordinary floods, 3121. The water passes off more rapidly than it used to do, 3122.—The manufacturing establishments on the sides of the Clyde are not allowed to throw anything into it, 3123.—They do not make much rubbish; the principal establishments are ship building and machine establishments, 3124, 3125.—There are police arrangements to prevent nuisances being committed, 3126.—The arrangements are such that the owners of the establishments would be proceeded against even if they were Clyde Commissioners, 3127, 3128.—The water passes off more rapidly in the Clyde, from the deepening of the channel, which may be attributed principally to the action of the river's traffic upon its bottom. The channel has also been gradually widened, but in some places is not yet completely so, 3130, 3131.—The action of the traffic would

URE, JOHN FRANCIS—*continued.*

not have been much without the works done upon the river, 3132.—The dredging also would not be so effective without walls. For instance, what has been removed out of the Tyne by means of jetties and these walls would have taken a great number of years if done by dredging. Above Shields Harbour there would have been about 1,500,000 yards to remove. 3133.—In the Clyde the works are carried on under Parliamentary powers, 3134.—There has been a settled engineer's plan, carried out under witness's direction. When the trustees went to Parliament for a plan to carry out their works, they could not get possession of the large quantities of land they wanted to purchase, without Parliamentary powers, 3135.—Within the last 30 years there have been three complete general surveys of the river made; the third is about now finished. But in reference to carrying out the details of the works they have been numerous, 3137.—With regard to Whitehill Point, no doubt, as a simple question of the improvement of the navigation, it would be desirable to have it removed; but taken in connexion with Shields Harbour, it might be desirable to retain it. Should think it prudent to leave the decision of that question till after the completion of the Hay Hole docks on the one side, and the Jarrow docks on the other; because the true direction of the currents will then be seen, 3138—The whole navigation from Shields to Newcastle would be considerably improved by enclosing Jarrow Slake, 3139.

WAKE, MR. WILLIAM.—(*Analysis of his Evidence.*)—Has been harbour master at Shields for eight years, 2931.—The harbour is very much improved since 1849, particularly in the port of Shields, 2932.—In 1847 the bar was very bad; there is a great improvement now, as regards both width and depth, 2933, 2934.—There is a much larger space for the berthage of ships in the harbour, 2935.—The water is a good deal improved in the lower part of the harbour, 2936.—In South Shields there is a great improvement both as to depth and width, 2937.—Since 1849 the Commissioners have increased the number and extent of the moorings in South Shields harbour; at North Shields they were laid down before that time, 2938.—The money laid out there has been principally expended in moorings, 2939.—The sailing channel from the harbour to Bill Point is much straighter and deeper, but not so wide as she was formerly, 2940.—There is not nearly so much sand as there used to be at low water, 2941.—Since 1850 has kept a regular record of the tides according to the Admiralty formula, and has made monthly returns, 2942, 2943.—Thinks there is very little difference in the ebb of the water at Shields than formerly, 2944.—Made some observations on the tides before 1850, but since that time has made them upon the formula supplied by the Admiralty. It shows the lift of the tides at high and low water, 2945, 2946.—The moorings at South Shields were laid down from funds provided by a tax upon shipping; the tax was laid by the consent of the shipowners in the time of the old corporation, 2947–2949.—The effect of the moorings on the south side has been to deepen the harbour, 2950.—The bar was very bad in 1849, but is now very good. Has known considerable variance in it from time to time, as much as two feet, depending upon the state of the freshes and the wind, 2952, 2953.—The bar was two feet worse in 1847 than in 1850. There has been a steady increase of depth during the last two and a half years, 2954, 2955.—A great many of the ships that come across the bar go to Newcastle, 2956.—There is a very good tide guage at the Low Lighthouse, the observations registered by it go from time to time to the Trinity House, 2958, 2959.—The observations registered by this instrument are of great benefit to the pilot, 2960.—It is a self-registering instrument, 2962.—The paper which registers the observation is on a cylinder, and cannot be taken off while the instrument is at work, without interrupting the register for the time, 2963, 2964.—Has not the management of the tide gauge. Witness makes his remarks from another in front of his own office, levelled by Mr. Comrie. There is another above the Low Lighthouse, levelled by Mr. Calver, 2965.—The exact depth of the water on the bar can be told by that instrument. There is a dial on the front of the Lighthouse which corresponds with the gauge; in the night time it can be seen distinctly in the harbour with a spy-glass, 2966–2969.—Supposes the dial refers to the state of the bar at the present time, 2970.—If a fresh

WAKE, MR. WILLIAM—*continued.*

were to come down the river, altering the bar in the course of 24 hours by a depth of two feet, giving two feet more water than the marks, does not think the tide gauge would show the change without some change in the instrument, 2971.—The ebb and flow of the tide would remain the same, but the position of the top of the bar would be lowered, 2972.—To show the depth of water on the bar the tidal gauge must be set to the last reported state. Believes the instrument can be adjusted to the state of the bar, 2973, 2974.—It is under the charge of the keeper of the Low Lighthouse, 2975.—Believes it to be a very correct gauge, having observed it by his own, 2976.—The pilots make use of their own marks in the pilot code. Does not understand their marks; they are not in figures. Understands the marks on the rocks, 2977–2979.—The pilot establishment is entirely out of the jurisdiction of the harbour master, and under a ruler of pilots appointed by the Trinity House of Newcastle, 2980, 2981.—Was appointed harbour master in 1846. Since that time has taken measurements and soundings at various times, but in consequence of the jealousy of the pilots thought it better to leave it entirely in their hands, and to have a report sent to the harbour master's office every time the bar is sounded. Received one about three years ago, 2982–2984.—Sounded the bar last October; found then about seven feet at a clear spring tide. Has various soundings, but none so recently as the pilots, 2985–2987.—It is his duty to know the state of the river from Shields to Bill Point, 2988, 2989.—The facility of navigation from the bar to Bill Point is very much improved, 2990.—In South Shields harbour the berthage is a great deal larger; within seven months of the moorings being laid down the width increased 138 feet by measurement, 2991.—In 1837 had a cargo of linseed from the Black Sea, and could not get a pilot to take the vessel if she drew more than 12 feet of water; now vessels that draw 14 feet go to Newcastle Quay, 2992.—On the 24th of October 1854 a barque went from Shields to Newcastle drawing 15 feet of water; William Graham was the pilot. There was a rise of 15 feet at Shields that day by witness's gauge, 2993.—Heard of a Hamburgh barque coming up, drawing 14½ feet, but has no knowledge of it, 2994.—The pilot is paid by draught. In September last a vessel came up, drawing 12 feet 11 inches water at the dead of the neaps, 2995.—In 1837 could not get a pilot to take a ship up till she was lightened to 12 feet water, 2996.—In 1848 it began to be better, 2997–3000.—In 1846 the bar was very bad, 3001.—Does not think the river was better for navigable purposes between Shields and Newcastle before the year 1846 than during the years 1846, 1847, and 1849, 3002.—What the shipping want to know is the actual depth of the water upon the bar, 3003, 3004.—The dial shows the rise of the tide, and there is no doubt of its being correct; but it is also an advantage to a ship to know the state of the bar, if she is drawing much water, 3005–3007.—Sometimes a fresh has taken almost all the ships away, and broken the moorings in Shields harbour, 3008–3009.—There are now from six to nine vessels in a tier in Shields harbour, much the same as formerly. There are now more in the lower part of the harbour. There is a greater width since the moorings were laid down, and the insand has gone to the southward, 3010–3013.—Shields harbour holds a great many more ships than it did 20 years ago, 3014.—The greatest improvement is in South Shields harbour, owing to the laying of more convenient moorings. The ships are laid so as to affect the scour, so as to go over to the north shore, 3015, 3016.—If the entrance to the river were widened, so as to admit the run of the sea more than is now the case, three or four tiers of ships on the north side of the harbour would feel the inconvenience, 3017, 3018.—In the plan of the pier, thinks the north pier goes rather too far out, but not the south, 3019.—If a pier were carried out from under Tynemouth Castle it might affect the passage of the tide coming into the harbour if it extended beyond the south pier, but not otherwise, 3020.—Thinks a south pier would assist the tide coming into the harbour, if taken as far as the bar line, 3021.—Has no anxiety as to the effect of a pier carried out from the north side; it would take away the bank upon the north shore at Lighthouse Point, which is only 430 feet wide at the Narrows, 3022.—The construction of piers would be an advantage, and two would be better than one; they would make the harbour smoother, 3023.

WAKE, Mr. WILLIAM. (*Further examined.*)—Is a younger brother of the Trinity House, 3897.—There are 12 elder brethen, besides the master, 3898.—Previously to becoming harbour master had a seat at the board, but not since, 3899.—Ten of the younger brethren sit at the board with the 12 elder brethren, and manage the business, having equal authority in voting on all occasions, 3900, 3901.—Is still a member of the Trinity House, and knows the arrangements pretty well; but in consequence of a bye law cannot hold his seat, having taken a situation under the corporation of Newcastle, 3902.—The Trinity Board practically appoints the pilots. The Board itself, 3903, 3904.—When matters of business are discussed generally the whole number of elder and younger brethren attend; they used to do so when witness was at the board. Believes they have now formed a Pilot Committee, 3905.—The pilots are examined by the master and elder brethren, and as many of the younger brethren as choose to question them, the same as at the Trinity House in London, 3906.—The Low Lighthouse is under control of the Trinity House, 3907.—And the High Lighthouse also, 3908.—If the bar changes much, it is the duty of the pilot master to make it known to the Trinity House, 3909.—The ruler of the pilots, Mr. Pearson, 3910.—When there is a favourable opportunity he is ordered to sound the bar, to see whether any change has taken place, particularly after any gales of wind or freshes, and to report immediately to the Trinity House, 3911.—A committee of 12 pilots, selected for settling any trifling dispute among themselves, decide at the same time those marks by which the pilots know how much water is on the bar, now existing in the pilots landing, 3912.—Believes it is according to their own regulations by that Committee. Settled entirely among the pilots, 3913–3915.—In case of a pilot making any mistake the owner of the ship, if there is any damage, reports to the ruler, and the ruler makes his report to the Trinity House, 3916–3918.—The Trinity House of Newcastle holds its regular periodical sittings of the Board the first Monday of every month. The Committees appointed of late years for different purposes meet at different times during the month, 3919.—Believes they are all of opinion at the Trinity House, at the present moment, that the bar is much better than it has been for some time, 3920.—As compared with former times they consider the access to the harbour narrower at the entrance at the Narrows; at present there is no middle ground, it grows up in summer, 3921.—Believes some of them are in favour of piers and others are not, and there is a difference of opinion as to the extension of them, 3922.—They are not unanimous in opinion, but believes in general they are in favour of piers of some kind, 3923, 3924.—The difference is as to the mode of construction, 3925.

WALKER, JAMES, Esq. (*Analysis of his Evidence.*)—Held an inspection at Newcastle in 1852 on the subject of the piers, 4434.—Believes the river Tyne above Shields harbour has improved, but has not been employed professionally by the Tyne Improvement Commissioners to give an opinion upon the improvements of the river generally, 4436.—The general navigation of the river would be improved if outer piers were constructed. Thinks this opinion is universal, 4437.—Is aware of the system which has been followed in the works on the Tyne generally, from having read the evidence occasionally. The improvements in the lower part of the river are not altogether unconnected with the piers, as works might be carried on in the river which would neutralize their effect, 4439.—Refers now to the abstraction of water by the Jarrow Slake Dock, and still more by the abstraction of the whole lake; also by the Hay Hole Dock, and other abstractions; that is to say, if the whole or the principal part of the lake were abstracted, 4440, 4441.—The abstracting of the whole of Jarrow Slake would be prejudicial to the entrance of the river and to Shields harbour. Stated in the House of Lords that the good effect of the piers would be counteracted to an extent, if Jarrow Slake were abstracted. Has looked at the slake with reference to three schemes at different dates; first, when a small quantity was proposed to be abstracted for the formation of docks; then, a second time, when a larger quantity, but still only half the present dock area, was to be abstracted, upon which he reported to the Admiralty that docks would be a great improvement to the port, but recommended that the question and principle of backwater should be attended to; and stated at the time,

WALKER, JAMES—*continued.*

although the quantity was comparatively small, the mode in which he thought the parties should respect the principle, 4442.—The enclosure of some portion of Jarrow Slake for the purposes of docks, under Act of Parliament, is the inquiry on which he gave evidence in the House of Lords, 4443.—After the construction of these docks there will remain about 230 acres of the Slake; about one third is to be abstracted. The effect of it will depend also upon the river line which the parties mean to adopt, and whether they facilitate or render more difficult the entrance of water into the Slake, 4444, 4445.—Whatever works might be carried on in the river would not affect the plan witness would adopt for the construction of piers, provided they do not diminish the tidal water, 4446, 4447.—Assuming that what Mr. Brunel calls river lines are well suited for the purpose, witness thinks the system which is now being acted upon for improving the Tyne is the proper mode of improving the upper part of the river, where the river, as a navigation, depends chiefly on land water; but in the lower part, where the effect depends on the tidal water, thinks the walls should be so low that, while they guide the stream, the tidal water should be allowed to ebb and flow over them. The Clyde is an illustration. Shows a plan of the same, 4448.—Believes the low walls in the Clyde are little above the level of the sand, 4449.—Some of them are above the level of low-water mark; they vary as to how much above it. There are private owners in the Clyde who have to be humoured, 4450, 4451.—In some places the sand is above low-water mark. Witness reads a passage from his report on the relative effects of land floods and tide water, which will explain his meaning, 4452.—The freshes on the Clyde are very sudden and reach very high, at other times the supply of land water is small, 4453.—Thinks it comes down more rapidly than in the Tyne. Understands from Mr. Brooks that the velocity in the Tyne during a heavy land flood is very great, so much so that, as in the Clyde, the rise of a neap tide does not change the current, 4454.—Has not given sufficient attention to the Tyne generally to be able to draw the line between the part which should be devoted to the effects of the land floods, and the part which might be called the estuary of the Tyne, 4455, 4456.—Considers that the turning point between tidal and river water should be above Jarrow Slake. Has read some of the evidence which has been given before the Commissioners as to the water being carried higher up if excluded from Jarrow Slake, at which he was surprised, 4457.—There are several wide places in the river above Jarrow Slake, say up to Hebburn Quay, which afford a considerable space for tidal waters, 4458–4460.—These spaces are still covered with water at high water; thinks probably they would come within the distinction which witness made of a tidal estuary as compared to a land water river, 4461.—Should not let those spaces be reclaimed by a full-tide wall. States this with a condition, as the value of the ground may be applied again to improve the river in another way, as by dredging. Considers that the quantity of water which goes up is just that which is due to the receptacle to be filled, and that if the receptacle is diminished, the velocity and depth of water passing through the Narrows is diminished. If the river water were stopped going up by a dam across the river a few miles above the Narrows, the velocity of the water passing through the Narrows would be very small, as it would only have that small space to fill; whereas, if the receptacle to be emptied and filled at each tide were enlarged, either the velocity or the sectional area throughout the Narrows, or both, would be increased, 4462.—Does not agree as a general proposition, that it would be equally beneficial, if that increase took place higher up the river, as if it took place by an enlargement down at Jarrow Slake; it depends how high up the enlargement might be. Thinks the river would be more improved by the increased quantity of water going up, as to Newcastle, than if the enlargement took place as low down as Jarrow Slake, but as regards the bar and Shields Harbour thinks otherwise, 4463, 4464.—Explains why, 4465.—Assuming Jarrow Slake to be below Newcastle bridge, witness thinks that it would be in a very good situation for improving the river, but by no means a good situation for improving Shields Harbour and the bar, 4467.—Thinks it is stated by other witnesses that the water goes off Jarrow Slake at one quarter ebb and reaches the bar at about half ebb, at which time the effective velocity upon the bar is stated to be the greatest, 4468.—Believes that the mud at

WALKER, JAMES—*continued.*

Jarrow Slake is on the average about half tide, 4470.—The water leaves Jarrow Slake at a quarter ebb, and reaches the bar at half ebb, and that is from 3 to 4 miles per hour at the bar, 4472.—Thinks this is Mr. Calver's evidence, 4473.—If the value of the enclosed land should not return so as to assist the river in any other way, witness would then leave it unenclosed by full-tide walls, but would train the river and confine the navigable channel by low walls, rubble dykes, 4475.—Has not seen any evidence given before the Commissioners on the subject of piers except Mr. Stephenson's, 4477.—Witness's reasons for his particular plan are best explained in the printed report. Was not aware that the particular formation of the piers was to be discussed before this Commission, but is willing to go into it as far as an unprepared witness can do, 4478.—Considers that, practically, by the north pier preventing the north and south flood tide current from entering the river so freely, that projection will not diminish the amount of tidal water that will enter the Tyne. Does not think the water will be at all throttled by passing through the opening which witness has supposed of 1,100 feet in width between the piers. Cannot understand that if an opening be made sufficiently large to pass all the water which is necessary for the river Tyne, the water will be at all throttled by passing through the opening which witness has supposed of 1,100 feet in width between the piers, when at the Narrows it is not above half that. Explains how these piers will facilitate ships entering. Witness went into this question very fully when named by the Tyne Improvement Commissioners, and appointed by the Admiralty, to do so. Had a dozen designs given him for piers, and does not think he can improve this one. An objection might at first sight be made, namely, that there is a space between the Narrows and the piers in which the outgoing stream would be at liberty to take a crooked course, and to form shoals and irregularities; but nothing of that sort takes place now, and witness thinks his piers would rather diminish the possibility of such a thing, but, should it be necessary, he has provided for training the channel between the Narrows and the pier heads (as shown in his report,) by means of an artificial sand-bank made with faggots; would also, if it was required, dredge out a fair channel for receiving these materials, 4479, 4480.—Faggot banks are being used at Dover Harbour as groins, to keep the shingle up against the town; the same is being done by the South-eastern Railway Company for a similar purpose, 4482.—Thinks that the water, although at right angles to the opening, would at once take a direct line from the mouth of the pier to the Narrows, 4483.—Thinks the water, after entering, will not have such southerly tendency as to be practically felt. The velocity of water entering will be considerably greater. With the tide running in a southerly direction, the water may have a little devious course, but it will necessarily and quickly come back and go into a straight line, and take the course of the greatest velocity, 4484.—The principal object is to obtain an increased amount of shelter, and to add to the facility of ships entering, and also to keep a direct, thorough straight channel to the outside of the piers. It is quite evident that, without danger of any kind, a something might be put down which would prevent the erratic action of the water. Thinks there will be an inclined plane from the pier heads down nearly to the straight line of the passage, 4486.—Does not think any training would be wanted, 4487.—They have merely made a beginning of the works of the south pier, 4488.—There is some quarrying done at the Trow Rocks. By the Act of Parliament the Commissioners were obliged to begin the works by a certain time, and they have just done that. They have made a beginning. A length of ashlar foundation course is also laid upon the north side, 4489.—A purchase has been made from the Dean and Chapter, 4490.—It is not witness's buying; he did not approve of it as regards the money given for it; but that was no business of his. Understands that the Commissioners have purchased 36 acres of rock, 4491.—It lies extremely convenient, and may be worth all the money that was given for it, and more, to the Commissioners; believes it to be so, 4493.—Mr. Rendel submitted a plan for piers, and he gave evidence to witness, and understands that he has given evidence here on witness's piers. Gentlemen who have read this report will see that witness has paid every proper compliment to the engineer to the Commissioners, Mr. Brooks, and the plan which witness has recommended is on similar principle to one of the three plans which he gave in, 4495.—Thinks it would be desirable to go on with both piers as far as the Admiralty powers will enable that to be done, and without delay, with a view to finishing both as soon as possible; thinks it would be a mistake to put up the 500 feet, and that only of the north pier; would go on with the foundation of the north pier as far as the Admiralty would allow, 4496, 4497.—And also would go on with the south pier, 4498.—Would keep the two going on together, believing that it will not be a perfect work till both are done, 4499.—Both piers are for giving shelter, and both are for the purpose of carrying out the ebbing river tide to such a distance as would join the ebbing coast tide and carry the bar away from the mouth of the piers, 4500.—Witness showed Sir Francis Beaufort the twelve plans which were given in to him, who, after examining them all, said that he did not say it might not be possible to make even a better plan than witnesses, but that he had seen nothing so good, and that he did not see how it could be improved, 4501, 4502.—Assuming that the pier would be in direct opposition to the first flow of the tide, witness sees no objection to it at all; the effect will be to alter the stream both of the ebb and flood tide, and to concentrate the whole into one straight line from the pier heads outwards, increasing the velocity of the tide at the mouth of the piers; thinks the change, both as regards the flood and ebb tide, will be beneficial, 4503.—Looks to the filling the basin as the effect of statical pressure outside the piers alone, without any assistance from the tidal impulse from the body of water in motion horizontally, except as regards the ebbing tide, when the water from the harbour and bar will be joined by it, 4504.—Considers the tidal impulse to be the effect of the same cause; the current inwards is the effect of the void. Witness transfers the inlet to the pier head, and collects it there, 4505, 4506.—If the water excluded from Jarrow Slake should go higher up, it must be attended by a considerable rising of the general surface up at Newcastle, 4507.—If the water should go higher up than Jarrow Slake, it would produce a reflex action, in consequence of it at the minimum section at the Narrows, which would exclude a portion of tidal water otherwise coming in through the piers, 4508.—In page 11 of witness's report of the 15th November, which is addressed to the Commissioners, he says, referring to the different plans, "At the same "time I am desirous to do justice to their authors, "and have, for the better enabling me to consider "their various features, had the whole drawn out to "the same scale, a copy of which, and also of my notes "containing the substance of the evidence taken by "me, can be sent to you if you desire it." Addresses that to the clerk of the Commissioners, 4510.—The plans have not been sent to him, for he never asked for them, 4514.—Nor the notes of the evidence, 4515.—Was the inquiring officer upon the part of the Admiralty on the 1st of March 1852 (the proceedings on which inquiry are printed) into the then Parliamentary plans of Mr. Brooks and the Commissioners for piers, 4516.—Remembers Mr. Clayton saying something to this effect before him. The plans which were then before him were the Parliamentary plans of the Session of 1852, and Mr. Clayton said, "At the "same time I ought to mention, that if Mr. Brooks "had had his own way he would have drawn the "northern pier from the point of the castle beyond "Prior's Haven; that is not the Commissioners' line, "but it is the line which Mr. Brooks, their engineer, "would probably have preferred. I thought it due "to Mr. Brooks to make this statement. The Com-"missioners have laid down the line which, in their "judgment, they deem to be the best," 4517.—That took place before witness in March 1852, at the Queen's Head, Newcastle, upon the inquiry, 4518.—Believes it was upon the Parliamentary plans which the Commissioners had selected, and as to which Mr. Clayton said, that if Mr. Brooks could have had his own way, he would have preferred to have taken it beyond Prior's Haven, 4519.—Witness does not say he selected Mr. Brooks' plan alone; there were other plans besides Mr. Brooks', 4520.—Has said that he had no objection to furnish to the Royal Commission the plan to which he before referred, but, in consideration, doubts whether he should not give offence to some of the authors of those plans by laying them before this Board without their sanction, 4523.—Witness selected these piers entirely on his own responsibility as an engineer, 4524.—The water inside the piers would be

WALKER, JAMES—*continued.*

comparatively quiet compared to what there would be outside, 4525, 4526.—There would be no sea inside, 4527.—Thinks the sand inside the piers would have a tendency to grow up at the sides, not in the channel, 4528.—Against the piers it would grow to a considerable extent, 4529.—It would do for vessels to beach upon, though they would do better to go on to Newcestle, if there was water enough, 4530, 4531.—The height of the tide outside the piers will affect the amount and velocity inside the piers, 4532.—As those piers are arranged, the orifice for the line of the current going in is nearly at right angles to the flood tide, 4533.—The amount of water which goes in will be very little affected, or dependent on the amount of the flood tide passing nearly at right angles across the entrance, 4534.—As witness did not think of the effect of the question, he did not at all interrupt counsel or the learned Commissioner in what he said with regard to the direction of the flood tide; but the direction of the flood tide would not be at that part at right angles to the direction of the pier; it is at a considerable angle from the pier heads, 4535.—When the piers are constructed, the current of the flood tide will be nearly at right angles to the direction of the entrance, which is not the same as it is at present, 4537.—Regards the state of things when the piers are made, as the filling of an internal receptacle, and that therefore the quantity of water going in will depend upon the amount of that receptacle. Witness therefore trusts that the Royal Commissioners will not lend their assistance to diminish that receptacle. The diminution of the slake, already sanctioned by Parliament, for the proposed dock, will have a tendency to the silting up of the remainder of the slake, and therefore it may be equitable to ask the dock proprietors to take measures for maintaining the present depth over the 230 acres that will remain, 4538.—By "that receptacle" witness means the receptacle formed by the river generally, including Jarrow Slake, and the recesses and bays, 4539.—These piers were projected as the best, in witness's opinion, in an engineering point of view, and without reference to the means which were at the command of the Commissioners for carrying them out, 4542.—Witness has had no occasion to change the opinions which he expressed in his evidence before the House of Lords on the Jarrow Bill at Question 617, but is anxious about the last passage in it, 4543-4545.—Witness reads his Answer to Question 624. The last part refers to the Admiralty proposition, which was, that the railway company should be obliged to deepen above Jarrow Slake. Did not agree to that; thinks it should be below Jarrow Slake, 4546.—Does not mean to say that the abstraction of Jarrow Slake would not improve the river in some degree above. Presumes that the works which the Commissioners are carrying on above Jarrow Slake are improving the river upwards, but does not think their improving it above Jarrow Slake should entitle them to injure it below. 4547.—Witness reads Question and Answer 641.—The rise referred to at Newcastle seems enormous now, but does not believe that the Tyne at Newcastle will be raised as much as a foot by any improvements which can be made, 4549.—The tendency of the erection of the south pier will be to cause a silting up of the sand in the enclosed area out of the channel, which will have a tendency to form a natural bank, so as to assist in directing the current of the ebb, 4550, 4551.—Outward-bound ships will be benefitted by the shelter given by the north pier, as well as inward bound, 4552.—The principal benefits from the piers are the sheltering of vessels, and the guiding the current of ebb so as to get it out into deep sea, and getting the bar into deep sea, and diminishing the bar. In Great Yarmouth harbour, with which witness has had to do for many years, the bar is removed altogether, 4553, 4554.—A large portion of the ebb now goes over the rocks abreast the Spanish Battery, 4555.—That will be directed into a straight channel, 4556.—Steam tugs would be better able to get out to the assistance of vessels, 4557.—Steam tugs are very much used in the Tyne, and also screw colliers, which are getting more into use, 4558.—The increase of steam vessels is very much in excess of those vessels propelled by sails; has had occasion in the River Thames to look into that subject this session, and it appears that a great deal of the trade of Shields and Newcastle is now being carried on by steam vessels. This will improve the Thames, the navigation of which is now so much encumbered by colliers lying in the stream to

WALKER, JAMES—*continued.*

unload, 4559.—The per-centage of steam tugs employed in towing vessels up the Tyne has very much increased, 4560.—Believes vessels generally use steam tugs, 4561.—Witness holds the same opinion now which he expressed in 1854 in Answer 617, 4562.—In giving answers about Jarrow Slake, witness first states that there will be an abstraction, and then argues upon the effect of that abstraction, 4563, 4564.—Agrees that, taking the river as a whole, if its capacity is increased as a reservoir for tidal water, it is a compensation for a lateral abstraction of the tidal column, but objects to the word "compensation." If in order to do good up the river, contractions and half-tide or whole-tide walls are made, that gives no right to do an evil at Jarrow Slake, 4565, 4566.—Suppose that state of things to take place, and that there were a depression of the low-water surface of the river, it would be a sign that the capacity of the river as a tidal receptacle was improved, 4567.—Cannot say whether that is a fact in the Tyne, but believes that all those contractions will deepen the low water: but they may, notwithstanding, be an abstraction from the quantity of water which goes out over the bar; they are chiefly confined to the improvement of the particular parts opposite to which they are made, 4568.—The lowering of low-water mark would leave a greater space to be filled next tide between that low-water mark and the high-water mark, and would be beneficial in every way. In order to benefit the bar or Shields Harbour, the addition which is made to the quantity of water should be at the time of the greatest velocity of the tide over that particular place. As respects the harbour, witness would like to put Jarrow Slake a mile or two higher up, to be nearer the time of half ebb when the water from Jarrow Slake should pass over Shields Harbour, 4569.—Witness is not aware that the range of the tide has yet been interfered with by any works of the Commissioners below Jarrow Slake, Understands that they are making a very large enclosure just opposite Jarrow Slake, 4570.—Has not compared the recent survey by Mr. Comrie with the surveys in 1849, or previous years, 4571.—Is not of opinion that the water which is to be excluded from Jarrow Slake will go into the upper parts of the river. Thinks the two have nothing at all to do with each other. If Jarrow Slake be kept open and the river improved, the water coming in through the Narrows will be sufficient to fill both; but if Jarrow Slake be excluded the quantity going up will only be that to fill the river, 4572.—Does not think the removal of Jarrow Slake a little higher up would be so much more beneficial as regards the bar, to which witness thinks, in the former parts of his evidence, he alluded, but it would be more beneficial as regards Shields harbour, 4573.—Speaks, as he named, very much from the survey of Mr. Calver, who says, that at present the water from Jarrow Slake reaches the bar at the half-tide, which he describes as the time of the greatest velocity, 4574.—Three quarter ebb would not be better. If Mr. Calver be correct, it is a matter of observation, that depends entirely upon when the greatest energy of the ebbing tide is; Mr. Calver says, "half ebb," 4575.

WALKER:

Some particulars respecting the agreement for Mr. Walker to superintend the works, *Clayton*, 3550.—A good deal of ballast, &c. was washed in, *Straker*, 356.

WALKER ESTATES:

Are chiefly let to tenants upon leases, who have built quays, *Clayton*, 3356.

WALKER IRON WORKS:

The area added to their works was made entirely with slag from their own works, *Brooks*, 2068–2072.

WALKER SAND:

Above Bill Point, *Danson*, 1524.—Has been partially acted upon, but it was effectually removed, *Brooks*, 1983.

WALKER STAITHS:

The distance from witness's lines to the high-water line at that point is about 200 feet; the area of that piece of land is considerable, *Brooks*, 2081.

WALKER QUAY:

A great portion of it was constructed upon Mr. Rennie's line before witness entered on his duties as engineer, *Brooks*, 2065.

WALLS:

Believes the walls, as far as they have gone, are but little above the level of the sand, *Walker*, 4449.—It is desirable to train the river, as in the Clyde, by low walls, *ib.* 4475.

WALLS, HALF-TIDE TRAINING:

Understands Mr. Rennie adopted the principle of them generally in his report, *Linskill*, 1046–1049.—The River Lines Committee unanimously recommended one from Muckhouse to Hebburn Quay, *Stevenson*, 1118.—Mr. Brooks asserts will fill up to solid land, *ib.* 1191, 1192.—Approves of them, on the authority of Mr. Rennie, in his report of 1813, *ib.* 1193–1199.—On Jarrow Slake, and the whole of the river below Bill Point, thinks the heavy gales would prevent the silting up above the height of the walls, *ib.* 1210.

WALLS, TRAINING:

In the Lune, they improved the channel very much; there was no loss of tidal water, *Stevenson*, 1215.

WALLSEND:

The width at the Dean and Chapter Land at Wallsend is 1,914 feet, between the walls 815 feet, *Brooks*, 4806–4808.

WALLSEND BIGHT:

Points out the direction of, *Calver*, 1691.—The channel has been shut out through Wallsend Bight, *Brooks*, 1983.

WEAR:

Produces charts, and compares the state of the river in 1737 with its state at the present day, *Murray*, 4600–4611.

WELLS HARBOUR:

Is a series of meandering channels, traversing a great extent of flat land covered at high water. It is a purely tidal receptacle, *Rendel*, 4282.

WET DOCK:

The Commissioners are now making a wet dock on the north side of the river, which will restore the river, in point of fact, to the condition as previously recommended by Mr. Rennie, *Brooks*, 1983.

WHEEL:

Is caused by Tynemouth Head, and causes the 9-feet bar and the Insand, *Rendel*, 3961.

WHITEHILL POINT:

Between Whitehill Point and the bar, observed that no money had ever been expended there, with the exception of removing a few stones within the bar, *Straker*, 199.—The trading interests of South Shields and Shields Harbour would render it unwise to cut off this point, *Brooks*, 2296.—Does not obstruct the tidal column so much as many other parts of Shields Harbour, where there are many ships moored, *ib.* 2298.—As an engineer would wish it cut off, if it can be done without injury to the trading interests, *ib.* 2300.—The effect of cutting off Whitehill Point would be to destroy the works at South Shields, *ib.* 2427.—The coal staiths belong to the lessees under the Duke of Northumberland, *ib.* 2490.—Reason for having a projecting point there, *ib.* 2492.—Would cut off Whitehill Point if docks could have been provided sufficient to supply the water, *ib.* 2496.—Would leave it as a temporary projection to drive the water over to South Shields, but with the prospect of cutting it off eventually, *ib.* 2498.—The object of leaving Whitehill Point was to have more ships on the south side of Shields Harbour, *ib.* 2499.—Proposed to cut it off 200 feet within Mr. Rennie's line, to convert the frontages at South Shields into a wet dock, *ib.* 2715.—To cut it off would do good to the river, but would injure the water at South Shields, *Taylor*, 2824.—If it were cut off 200 feet you must then have something like docks, as proposed at South Shields, or you would have a shoal where there is at present deep water, *ib.* 2825.—At South Shields they decidedly object to Mr. Brooks' plan of cutting off Whitehill Point, *Mather*, 3804.—The South Shields people always opposed Mr. Brooks' plan of 1849, which proposed to cut off the Point by an extent of 200 feet within Mr. Rennie's line, *Robinson*, 3821, 3822.

WHOLE-TIDE WALLS:

Thinks the value of the increased momentum in additional tidal column up to Newcastle would not be made, judging from the Dee and the Clyde, *Rendel* 4279.

WILLINGTON AND WALKER:

Belong to the Corporation, *Clayton*, 3350.

WILLINGTON SAND:

Is worse than it was. *See* Sand, *Danson*, 1530.

WILLINGTON STAITH:

Ballast is washed in, *Straker*, 362.—As regards depth, it is the worst in the river, *Brooks*, 2109.

WILLINGTON QUAY:

The effect of that encroachment was, in the first instance, to cause an eddy below it to silt up the dock immediately below it, and to interfere very much with the staiths below, and with the shipping places at Hay Hole, *Straker*, 17.—Was first constructed, not upon Mr. Rennie's line, beyond Mr. Rennie's line, *ib.* 26.—Was commenced in Mr. Anderson's time, about 1838 or 1839, *ib.* 144–146.—When witness came, he found Willington Quay upon Mr. Rennie's line; made it go beyond it, because it was necessary to force the current into Hay Hole, *Brooks*, 2104, 2105.—Projected it about 100 feet beyond beyond Mr. Rennie's line, which improved the condition of the staiths in Hay Hole, in connexion with other works on the south side, *ib.* 2107–2113.—The attempt to carry out Mr. Rennie's plan produced very injurious effects, *ib.* 2445.

WINCOMBE LEE POWDER HOUSE,

Just below Bill Point: In May last, took soundings there and compared with the depth, and found there was a distinct difference from the Admiralty survey of 1849, *Calver*, 1857.

WITNESSES, LIST OF, page 523.

WORKS DONE BY THE COMMISSIONERS:

Points out several cases in which works done by the Commissioners have been almost injurious, *Straker*, 324.—Since 1850 some of the works which have been executed on the river have been brought before the attention of the Commissioners and ordered, and some have not, *Straker*, 882–887.—Generally, with a few exceptions, the works which have been carried on have been brought before the Commissioners and ordered by them, *ib.* 888.—The most material are those which tend to direct the river in a straight course where it is most interrupted by sand banks, *Brooks*, 2428.—The works should be done gradually, or the sudden effect would greatly impede the navigation, *ib.* 2429.

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